

ANCIENT HINDU MEDICINE

**AN INTERPRETATION
OF
ANCIENT HINDU MEDICINE**

**BY
CHANDRA CHAKRABERTY**

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TO
SRIJUKTA LAKSHMIKANTA CHAKRABERTY
THIS BOOK IS AFFECTIONATELY DEDICATED

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Foreword

I started this Book with the idea of making it a comparative study of the ancient Hindu and Greek systems of Medicine in the light of modern knowledge. But I soon realized that the Hindu students for whom this book is chiefly intended, would not be interested in the Greek Medicine, and as there are excellent translations of the works of Hippocrates,* I have confined myself to the interpretation of the Ancient Hindu Medicine alone.

I was forced to the conclusion that the Ancient Greek Schools of Medicine were indebted to the Hindu Systems for the following reasons :—(1) *Indigenous Indian drugs* are found in the works of *Hippocrates* as (a) *Kardamomon* from Sk. '*kardama*' (cardamon) as an emmenagogue in

* I. E. Littré : *Oeuvres Complètes D' Hippocrate* (Text and translation) 10 Vols. J. B. Baillier et Fils, Paris, 1839-1861. I have used this edition for my reference.

2. Robert Fuchs : *Hippokrates Sammtliche Werke*, 3 Vols. München, 1895-1900.

3. F. Adams : *Genuine Works of Hippocrates* (partial), Sydenham Society.

Vol. VII. p. 358 ; in dyspnea in Vol. VIII. p. 80 ; (b) *Amomon* from Sk. 'elā' (*Elettaria cardamomum*) as an emmenagogue in Vol. VII. p. 358 ; (c) *Peperi* from Sk. 'pippalī' (*Piper longum*) as an expectorant, mixed with honey-water in Vol. II. p. 464 ; in nasal catarrh in Vol. V. p. 183 ; in gingivitis in Vol. V. p. 244 ; as an errhine in Vol. V. p. 328 ; as a drink with honey, vinegar and water in Vol. VII. p. 150 ; with wine and oil in a pessary in Vol. VII. p. 364 ; in quartan fever in Vol. VIII. p. 654 ; *Dia-trion piperidon*, from Sk. *trikaṭu*, a preparation made from three species of '*Piper*' (*nigrum*, *longum* and *album*) ; (d) *Kinnamomos* from Sk. 'tvak' (*Cinnamomum zeylonacum*) with myrrha, and safran in fumigation in Vol. VII. p. 372 ; simple fumigation in Vol. VIII. p. 364 ; (e) *Akoros* from Sk. 'vacha' (*Acorus colamus*) with myrrha as antiseptic injection in Vol. VII. p. 368 ; made infusion with dry pomegranate skin in wine for astringent injection in Vol. VIII, p. 860 ; (f) *Nardon* from Sk. 'jaṭāmāṃsī' (*Nardostachys valeriana*) as antiseptic fumigation with cinnamon, myrrha and rose perfume in Vol. VII. p. 372 ; as an astringent antiseptic wash in lochia in Vol. VII. p. 04 ; (g) *Sesamon* from Sk. 'tila' (*Sesamum indicum*) as a vulnerary in

empyema—suppurative abscess in Vol. II. p. 518 ; in the treatment of adiposis in Vol. VI. p. 76 ; as a plaster in long-standing catarrh in Vol. V. p. 432 ; as a fattening food in Vol. VI. p. 258. ; as a nutritive food in Vol. VI. p. 544 ; as a substitute for cheese in Vol. VII. p. 78 ; in coughing of the children in Vol. VIII. 82 ; (h) *Zigiberis* from Sk. 'śrngavera' (*Zingiber officinale*) ; *Kostos* from Sk. 'kuṣṭha' (*Costus speciosus*) ; *Sakcharon* from Sk. 'śarkarā' (*Saccharum officinarum*) ; *Pepéreos riza* from Sk. 'pippalī-mūla' (*radix Piper longum*) ; *Kupeiros* from Sk. 'mustaka' (*Cyperus rotundus*) ; *Bdellion* from Sk. 'guggula' (*Aquilaria agallocha*) ; etc.

(2) *Humoral Pathology* : In 'Peri Physios Anthropoy' (On the Nature of Man) Vol. VI. p. 32-69, Hippocrates advances arguments of superiority of the principles of the four humors whose equilibrium in the body preserves the normal health and whose derangements are the etiological factors of disease, as the 'cima' (blood : Sk. 'rudhira'), 'phlegma' (phlegm : Sk. 'śleṣmā') 'cholen xanthen' (yellow bile : Sk. 'pitta'), and 'cholen melainam' (black bile : as a substitute for Sk. 'vāyu'), which he for the first time introduced into Greece over the ancient doctrine

of 'hot' (from fire) 'cold' (from earth), 'dry' (from air) and 'moist' (from water) qualities which were supposed to be the basic factors of health and disease, and which he also argues in his book '*Peri Archaias Ietriches*' (Ancient Medicine), Vol. I. pp. 570-637. In his '*Peri Gones*' (Generation, 3), Vol. VII. p. 474, '*aima; chole; udor, phlegma*' are mentioned as the four humors, using '*bile*' without any qualification, and in the place of one, '*udor*' (Sk. *udaka* = serous fluid) is substituted, thus proving that the humoral question was still in transitional flux, and was not settled or fixed. In '*Peri Chymon*' (Humors, 8, 14), Vol. V. p. 488, 496, seasonal changes are mentioned to cause the increase and the decrease of the humors, as the increase of the bile in the summer, and thus organisms are predisposed to certain diseases in particular seasons in which their controlling humors are predominant, in a very strikingly similar language as described in *Sūtrata* (I. 6) on '*rtu-charyyā*'. In '*Pery Physios Anthropoloy*' (The Nature of Man, 7), Vol. VI. p. 46, it is argued that '*phlegma*' is dominant in the winter, for the reason that man conforms to the laws of nature, and as everything is cold in the winter, and as phlegma is

the coldest of all the humors in tactile sensation, it naturally therefore is in excess over other humors ; in the spring, the blood is dominant, as the phlegma is still strong, owing to the plenty of rain and sap in the soil and plant, but it becomes desiccated by the warm sun ; in the summer, the blood is still strong, but the bile is formed by the strong sun. and the phlegma is in the minimum owing to the hot, desiccant sun ; in the autumn the blood is in the minimum, but the black bile is formed in abundance, as the season is dry and the nature tends to cool itself. In '*Peri Noyson to Tetarton*' (The fourth Book of *Maladies*, 33), Vol. VII. p. 542, it is described how the humors are in excess or in deficiency : "I shall describe now, how the bile, the blood, the '*udrops*' (serous fluid) and the phlegma are in excess or in deficiency ; it is through the food and the drink, in this way : the full stomach is the source of all things ; but when empty, it profits at the cost of the body which it disintegrates. Moreover, there are other four sources from which each of the humors can come to the organs ; they come to the stomach, and when the stomach is empty, they go to the organs (superficial), but they come back, when

the stomach has something (ingesta). The source for the blood, is the heart, for the phlegma—the brain, for the ‘udrops’ (serous fluid)—the spleen, and for the bile, the part that is in the liver (bile-duct).” And in the same book (34—38), it is mentioned that as the plant can select its food from the soil it needs, so each humor can get its nourishment from all kinds of food ; but phlegma is particularly increased by the ingestion of cheese, acrid substance, or phlegmatic food or drink ; the bile is increased by bitter food and drink, or bilious substance ; ‘udrops’ (serous fluid) is increased by the water one drinks, and is pumped by the spleen to itself and other parts of the body ; the blood is increased by the bloody food one takes, and which is attracted to all parts of the body, and especially by the heart. As the disease is caused by the excessive increment of one humor over the rest, its cure lies in bringing out the coction (*pāchana*) of the said humor, and cause its evacuation and expulsion from the body ; the crisis of a disease is the turning point when the coction of the deranged humor begins, and the coction produces the periods in fever (Vol. I. p. 617 ; Vol. II. p. 635 ; Vol. IV. p. 469 ; Vol. V. p. 485 ; Vol. VIII. p. 651).

(3) *India is directly mentioned in association.*

with some of the drugs : (a) "Echlephsanta onson treis *indichoy pharmachoy* tou ton opthalmon, o chalectai peper,chai tou stroggyloy, tria tauta leia trihein,chai oino palaio chliero dieis, balanion peri pteron ornithos tithenai,chai ode prosagein." (Another : three decorticated grains, *Indian drug* which is for the eyes and is called 'pepper', the round grain—these three are to be pounded and moistened with warmed old wine, it is to be pasted round a plum, and to be introduced thus (as a pessary). *Gynaikeion Proton* : (Female Diseases, 81 ; Vol. VIII. p. 202). (b) "Echlephas chochchous pentechaidecha,esto de chai *indichoy poson*" (Or rather decorticate fifteen grains of Cnide, and add to it, the *Indian preparation* ; ibid 158 ; Vol. VIII. p. 336). (c) "Toyto to pharmachon odontas chathairei chai euodeas poieei chalectai de *indichon pharmachon*." (This preparation cleanses the teeth, and imparts to them a fine aroma ; it is called *Indian preparation* ; ibid 185 ; Vol. VIII. p. 366). (d) "Eteron prostheton echlephas chochchous triechonta, to *indichon*, o chaleousil oi Persai peper." (Another pessary : thirty decorticated grains, and the *Indian substance* which the Persians call 'pepper', ibid 205 ; Vol. VIII. p. 394).

(4) *Indirect Inference* : Urine of cow

go-mūtra) is recommended as a therapeutic agent in fistula, in Vol. VI. p. 453 ; as a disinfectant wash for the female genitals and in sterility in Vol. VII. p. 365 ; in fumigation and lotion in female diseases in Vol. VIII. p. 211. Cow-dung (*go-maya*) is recommended with aromatic substances as a fumigation in female diseases in Vol. VIII. p. 119. ; bovine desiccated bile (*go roohanā*) as a vulnerary preparation for wounds in Vol. VI. p. 415 ; in a purgative compound in Vol. VI. p. 419 ; in pessary with myrrh and honey in Vol. VIII. p. 59, 157, 203, 395 ; as a laxative drink with wine in Vol. VII. p. 425. The cow being regarded as the sacred animal of the Hindus, it can be imagined that her excretory products may be used in India as therapeutic agents, but their use among the Greeks who had no such passions, indicates their foreign importation.

It may be said that all the writings that are now included in the Hippocratic Collection were not the genuine works of Hippocrates (460--377 B. C.). That may be so. We are not concerned with that problem. It suffices for our purpose to know that the Hindu thoughts influenced deeply the Greek medical literature in the fifth and the fourth century B. C. We do not yet definitely know how the Medical science reached

Hellas ; perhaps by the Persian intermediatories, or directly by the Hindu settlers in the Persian Empire. We know that in 606 B. C. the Median king Cyaxares conquered Assyria and annexed to it the territories up to the coasts in Asia Minor where there were many Hellenic settlers. Cyrus, (559—530 B. C.) the great Persian nation-builder, defeats Astyages and conquers Media in 550 B. C., defeats Croesus, the Lydian king, and captures Sardis in 547 B. C., conquers Babylon and Greek cities of Asia Minor in 546—539 B. C. His son Cambyses (529—522 B. C.) conquers Egypt in 527 B. C., by defeating the Egyptian ruler Psammetichus III or better known as Amasis, under whom were numerous Ionian and Cartan mercenaries. The empire of Darius I (522---486 B. C.) extends from Macedonia to the Indus, and from the Danube and the Black Sea to Nubia; while in 512 B. C. Darius invaded Scythia, to subdue the nomadic hordes, his general Megabazus reduced Thrace, and a few years later penetrated up to the river Peneus in Thessaly; the Ionians revolted against the Persian domination, and with the assistance of Athenians and Eretrians, burnt Sardis in 499 B. C., which led to the Persian invasion of Northern Greece in 492 B. C. under

the generalship of Mardonius, and of Attica in 490 B. C., which ended with the defeat of the Persians at the battle of Marathon on Sept. 12—490 B. C.

Siddhārtha Gautama (*the Buddha* 563—483 B. C.) entered into '*nirvāṇa*' in 483 B. C. after a strenuous life of many years' preaching. In *Mahāvagga* (l. 6 ; l. 8) a very old Buddhist work of the fifth century B. C., we find description of advanced medical treatment.

But the Hindu influence over Greece even goes beyond that period. There is every reason to believe that the Dionysos orgies were the imported Soma-Śiva cult from India. Dionysos is a Moon-god like Soma. He introduced wine-culture (and civilization) into Hellas. The bull, the goat and the serpent are sacred to him. And he is represented like Śiva, as accompanied by a leopard, and in Alexandrian time, riding on a tiger (*Encyc. Brit.* Vol. VIII. p. 287). The Orphic religion seems to be no less indebted to the same source. Abstinence from meat, fish etc., from animal sacrifices, the wearing of a special garment, the practice of austere asceticism, belief in the transmigration of soul, and the soul will attain perfection, passing through various beings, and when it attains it, it will be free from rebirth—

the circle of generation' (*kyklos geneseos*), as the body is the bondage of the soul (Ency Brit. Vol. XX. p. 328)—all these unmistakably indicate pre-Buddhistic Indian origin, where these doctrines have been indigenous, and are still believed by the multitude. Arthur Lille in his '*Rama and Homer*' argues that in the Rāmāyaṇa, Homer found his theme for his great epics for the following reasons: (1) Like the two inseparable brothers in the Rāmāyaṇa, Rāma and Lakṣmaṇa, in the story of Menelaus, there are also two inseparable Greek brothers. (2) Rāma and Lakṣmaṇa have been banished by the conspiracies of a stepmother while the Greek brothers are banished from Argos by their usurping uncle Thyestes. (3) Sītā is born of a swan's egg (*Brahmā's emblem*) in a furrow, Helen is also born from a swan's egg left by her mother, Leda, the swan, and Helen emerged from her egg in a 'yperwon' which means a furrow. (4) At the '*svayṃvara*' Rāma defeats all the competing princes, and Sītā chooses him as her husband, and in Greece, Menelaus is made to defeat all the competing princes, and wins Helen, though neither a competing tournament for winning a bride, nor the choosing of a husband (*svayṃvara*) was

customary in Greece, and they were time-honored institutions in India. (5) Whilst Rāma is away, Sītā is carried away to Laṅkā across the sea ; likewise Helen is carried away across the sea to Troy. (6) Vibhīṣaṇa from a high hill points out to Rāma the principal warriors of the forces of Rāvaṇa ; Helen points out to Priam the chief Greek captains, after nine years of war and who came to rescue her. (7) The arrows of Rāvaṇa and the arrows of Hector come back to their hand after their flight. (8) As Hanumān with a mighty shout daunts the whole of the army of Rāvaṇa, so Achilles with a mighty shout daunts the whole of the Trojan army. (9) The heavens rain blood as an omen of the coming death of Rāvaṇa, and when the favorite son of Zeus, Sarpedon, is about to die, Zeus and Hera see a shower of blood falling on the battle-field. (10) The Hindu besiegers fare badly in the early encounters and Rāma proposes to bring the army back to India ; the Greek besiegers fare badly as well and Agamemnon proposes to carry the army back to Greece. (11) In the Rāmāyaṇa the Rākṣasas are depicted to be as big as mountains ; Mars, when thrown down by angry Pallus who flings a rock at him, covers seven acres with his

gigantic body. (12) In the Hindu epic, the gods and the demons gather round to watch the crucial battles between the paramount chiefs Rāma and Rāvaṇa ; in the Iliad, the opposing gods also crowd round to watch the course of the battle, though the chiefs are not paramount, nor the encounter crucial. (13) Kuvera, the god of wealth, and Śiva, the god of death, throw dice ; in the Iliad, Jove suspends golden scales. (14) When Sītā makes her determination to starve to death, Indra comes down and gives her the '*amṛta*'—the immortal food ; when Achilles is of the same frame of mind, though he was not a wronged party, Jove sends down Minerva with the ambrosia for him. (15) Vibhīṣaṇa is the wisest denizen in Laṅkā ; Antenor has the same reputation in Troy. When Rāvaṇa is about to kill Hanumān, the ambassador of Rāma, Vibhīṣaṇa remonstrates and saves his life ; when Menelaus and Odysseus came into Troy as ambassadors, they would have been killed, but for the intervention of Antenor. Vibhīṣaṇa advises Rāvaṇa to give up Sītā ; Antenor advises Paris to give up Helen. Vibhīṣaṇa conspires against his country with the enemy, shows the enemies how to pass the sea, reveals the secrets of the '*chaitya*' of

Nikumbhilā; Antenor also plots secretly against his own country, and advises Ulysses to seize the Trojan Palladium, and make the wooden horse. Vibhīṣaṇa, after the death of his brother and the capture of the city, becomes the crowned king of Laṅkā; Antenor founded a new kingdom out of the ruins of the old. (16) Rāma is loaned by the supreme god, his chariot with the celestial charioteer—Mātali, and the terrible missile '*Brahmaśiras*' which alone can kill the ravisher of Sitā, and the fiend of the gods. Achilles, the avenging hero, not the wronged husband, is given the coat of arms from the anvils of Vulcan, the chariot with the deathless steeds of Jove, and the charioteer Automedon who alone can drive such steeds, but he lacks the terrible '*arrow of Philoctetes*' which alone can kill the ravisher of Helen, and instead of killing the foe, he is himself killed by that foe. (17) Inconsistency and the lack of unity of the Homeric plot, and the invulnerable logic and conclusion of Vālmīki's story: cattle-stealing and wife-stealing being then the prevailing custom in Hellas, and Helen being carried off by a fop, and not a fiend of the gods, it could not have precipitated a war between two peoples.

Then the question arises as to the age of *Suśruta* and *Charaka Samhitās*, and that is very hard to determine with any positive certainty. All that we know is that the great Buddhist scholar Nāgārjuna revised the old *Suśruta*, and added to it the supplementary section (*uttara-tantra*). Nāgārjuna was a leading director of Kaṇiṣka's Council that was held about 78 A. D. He salutes *Suśruta* in the beginning of the work (*Suśruta* I. I) with Brahmā, Prajāpati, the Aśvins, Indra, and Dhanvantari. It must have taken centuries to have made *Suśruta* a mythical figure, and to be classified with the gods. *Charaka* is mentioned in the Chinese Buddhist chronicles, as the family-physician of the Indo-Scythian king Kaṇiṣka (about first century A. D.), and who attended at a difficult child-birth of his wife. But *Charaka* is a family name, and there is an old Vedic *Charaka* school, known as Kapiṣṭhala *Charaka* (I. 1. 3). The internal evidence of both the works indicates that they were composed in pre-Buddhistic times, though there are numerous interpolations of a later age. The '*Sūtra-sthāna*' (Section of General Principles) and the metrical portions which are more or less explanatory, seem to be later additions. Not only do the prose versions resemble the *Brāhmaṇas* in composition,

but all the gods also are post-Vedic, and the common use of meat, especially beef (Charaka I. 2, 18 ; Suśruta I. 46. 89), points out to a pre-Buddhistic age. The osteological nomenclature used in Suśruta is almost identical with that used in Atharva Veda (X. 2), and in the Śatapatha Brāhmaṇa (S. B. E. Vol. XLIV. p. 164). It is possible that the sage Yājñavalkya whose name is mentioned in the Brāhmaṇas, and in association with the King Janaka, the reputed teacher of the '*Vājasaneyi Saṃhitā*' (the White Yajur-Veda), and the Law-book is the same person, and he lived about sixth century B. C. And the King Janaka of Mithilā might have been known as '*Kāśi-rāja*' and Divodāsa. It may be said that the Hindu medical science could not make such a rapid advancement from the primitive magic charms and sorceries of the Atharva-Veda period, which has been put at 1000 years B. C. It is true that the '*Āyurveda*' (medical science) claims to be a branch of the Atharva-Veda, as the priest is the successor of the magician, and the medicine-man is a magician priest. But the Atharva Veda contains many of the oldest superstitions of the Indo-Dravidian masses, and they did not become embodied in the Ṛg-Veda, simply because they represented the attitude of the masses rather

than that of the nobility. And when they became hoary with age, they became entitled to respect, and became admitted in the sacred book. The Charaka is older than the Suśruta, for in anatomical description, physiological explanation, in the classification of subject-matter, in the form of language and in the therapeutic technique, it represents a more ancient school. As there are many passages that are common, it seems that they were borrowed by the latter from the former.

In the following pages, I have tried to interpret and explain the *Ancient Hindu Medicine*, principally based upon Charaka and Suśruta in modern medical terminology. Translation is an ungrateful task, especially of technical subjects, written nearly twenty-five centuries ago, their modes of expression being quite different from those of the present age. However, I have tried to be as careful and accurate as possible. The translation could be much improved by transposition of words, or outstretching their meanings. I have preferred accuracy to diction, and I have often sacrificed, whenever it has been necessary, a good literary form, to make it as true to the original as possible and to reflect its meaning.

Yet it is very likely that some of my inter-

pretations may not find ready acceptance in many orthodox quarters. But sooner it is realized, it will be better for the communal health, that the ancient medical works can not serve us to-day any other useful purpose than to supply rich materials for the cultural history of the race. Its prolific vocabulary might be also profitably utilized to create a National School of Medicine, for continuity of historic consciousness activates and acts as a stimulus for progress. And it is well to know and remember that many of the medical books before they come from the press need revision to be up-to-date, and most of them, before they are ten years old, are almost antiquated. Bacteriology, micro-biology, chemistry, bio-chemistry, non-irritant antiseptics, prophylaxis, serum-therapy, organo-therapy, skiagraphy and the mechanical appliances have completely revolutionized during the last generation in method and technique *'the treatment and prevention of Disease,'* which is the object of Medical Science (*Suśruta* I. 1. 12). Our very great achievements in the past, which we have every reason to be proud of, instead of inspiring us with the greatest efforts to lead in arts and sciences, should not mortgage our future to the *Dead Past*. For a race that does not take the utmost care and the most

advanced methods for the prevention of disease and the preservation of health, can not effectively compete in the struggle for existence, with more forward races, and succeed in the survival of the fittest. Health is the foundation of all wealth and progress. We can not afford to cling to an empty shell, carry the dead weight of the past on our back, sacrificing our future, unless we want to be counted with the extinct races.

At the other extreme, there may be some who will contend that I have made a free ride on the wings of imagination, and there could not be such an advanced medical technique in the remote past. I want them to follow closely the original text. I suffer from no national hypnotism or megalomania. Exaggeration, on the other hand, I believe, is apt to lower the intrinsic value of a thing. Have I been subconsciously influenced by the sense of the grandeur of the country, as an expression of suppressed or subdued patriotism? I leave that for the readers to judge. I have always believed that in ancientness—Egypt, in social polity—China, in art—Greece, have nobler records of fundamental value than India can boast of. I admit, with all her faults, I love my country. I take pride and glory in

her past achievements. Tremors of her new awakening from the slumber of centuries, have sent me joyous thrills, made me vibrant with emotions and intoxicating dreams. And I live to see that she will contribute her share, worthy of her past, promising of a bright and brighter future, to the advancement of Human Civilization, and take her leading place in science and culture, and in the Council of Nations. But when studying history, intellect should not and does not need to be influenced by a gamut of sentiments and feelings, and can be left free to exercise its supreme prerogative to judge facts as they are on their own merit. I have tried to keep that attitude of my mind—not to corrupt my intellect with emotions. In studying the medical history of India, one should not be misled by the prevailing pathetic condition,—lack of hygiene, vicious dietary of the rich and the poor alike, ignorance and ineptitude of the medical practitioners, and the credulity of the public, for progress is not always steady and continuous. Except in the application of the mechanical developments and the appliances of machine power, modern nations have hardly made any further advancement in pure arts and literature than the Greeks. Medieval Europe, after the

destruction of the Greek States and the downfall of the Roman Empire, sank deeper in superstition and ignorance. In medical science the name of Galen (Claudius Galenus 130—201 A. D.) remained as the only supreme authority in Europe up to the seventeenth century, and in the Saracen empire up to the fourteenth century. The Arabs formed an eclectic school of medicine out of the synthesis of the Greek and the Hindu systems. In India medical science had its highest expression under the Buddhist rule when the relief of pain, human as well as animal, was regarded as a state religious duty, and hospitals were built in every important locality for men as well as animals. In the famous Buddhist universities of Takṣaśilā and Nālanda, there were thousands of students from all parts of India and Outer-India who went there to study medicine alone. With the downfall of the Buddhist states, and the dispersion of the monks, whose principal duties were to administer to the sick, the acquired knowledge virtually disappeared from India, and healing became the profession of the mendicants by magic charms and incantations, or of the quacks, charlatans and barbers.

It is possible, however, that though I have

been careful in the selection of the equivalent scientific terms for the Sanskrit, a few minor ones may need revision. I have labored under great disadvantages. ' Though New York Libraries are splendid institutions, and grant liberal privileges and easy access to the books, there are very few books on Indian Medicine, and I have not been able to avail myself of any book on the subject. Moreover it is very hard to write competently for one individual on all subjects dwelt on in Charaka and Suśruta Samhitās, and as they are the product of a medical assemblage—the collected wisdom of the sages that gathered together from all parts of India, as the drugs clearly indicate, and Agniveśa and Suśruta might have simply acted as secretaries (Charaka I. 1. 3), so their interpretation could be best done by a medical association with competent departmental heads on all subjects dealt with in those works. Mine has been simply a pioneer attempt, knowing not whether this task has been undertaken by any efficient Indian medical organization, and I have had to work single-handed, without any advice from any source. This, I understand, can be no excuse or justification for any misleading statement or false conclusion, and I shall be

grateful to my readers to have them pointed out.

For transliteration, I have used the following method :—

| | | | |
|---------------|---------|--------|-------|
| अ = a | क = k | ड = ḍ | म = m |
| आ = ā or ḍ | ख = kh | ढ = ḍh | य = y |
| इ = i | ग = g | ण = ṇ | र = r |
| ई = ī ī, or ī | घ = gh | त = t | ल = l |
| उ = u | ङ = ṅ | थ = th | व = v |
| ऊ = ū or ü | च = ch | द = d | श = ś |
| ए = e | छ = chh | ध = dh | ष = ṣ |
| ऐ = ai | ज = j | न = n | स = s |
| ओ = o | झ = jh | प = p | ह = h |
| औ = au | ञ = ñ | फ = ph | ‛ = ṃ |
| ऋ = ṛ | ट = ṭ | ब = b | : = ḥ |
| ॠ = ṝ | ठ = ṭh | भ = bh | |

I regret very much that it will not be possible for me to add an index to this book. This work has already taken more than double of the time I anticipated it would require, and the pressure of other works does not permit

me to devote more time to it. Under these circumstances, I beg leave to bring to a conclusion the arduous task, I so light-heartedly undertook.

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364, West 120th Street, C. CHAKRABERTY
New York.

AN INTERPRETATION OF ANCIENT HINDU MEDICINE.

ANATOMY.

The ancient Hindu physicians lacked profound and accurate anatomical knowledge. They have left more or less superficial, vague and imaginary description of the human anatomy, as found in their treatises, except in osteology. There is nothing astonishing in this. The Hindu medical science developed in the Buddhistic period for alleviation of physical sufferings. The Buddhists regarded all life as sacred. They naturally regarded with horror the idea of inflicting pain, and of depriving an animal of life for experimental medicine. In a tropical climate, as a hygienic measure, cremation of the dead has been ordained as a religious duty from misty antiquity. So there was no regular chance for human dissection and to acquire the exact

knowledge of human anatomy. Whatever knowledge they acquired, they obtained it from personal observation and experience, from caring for the wounded and disabled on the battle-fields, from a comparative study of the animal anatomy from the sacrificial animals in the pre-Buddhistic period. There is no record of the custom of human sacrifice, except the legend of Śunaḥśepa (*Aitareya Brāhmaṇa*, VII.3), as the act was repudiated by all presiding priests of the Rājasūya ceremony. If it was a mock-belief as a reminiscence of the remote past, it, however, clearly indicates that human sacrifice was no longer countenanced by the Vedic priesthood and was not practised in the post-Vedic Sūtra period. The students of surgery were taught the technique of instrumental operation on dead animals and vegetables, as water-melon, cucumber, pumpkin, gourds or skin-bags filled with water (*Suśruta*, I. 9. 2-5). Under these circumstances, proficiency was not possible.

Neither in Greece was it better. In the time of Hippocrates, the anatomical knowledge was very defective and superficial. No differentiation was yet made between the arteries and the veins and both were called 'phleps'—blood-vessels.

However, this distinction was made by Polybus, but on the whole his anatomical and physiological knowledge was erroneous. But Aristotle (*B. C. 385-322*) by his comparative study of animals, laid the foundation of positive anatomy and physiology. In his '*History of Animals*,' he devotes two-fifths of the work, the first four books, to the structural constitution of animals. He synthesizes all the knowledge of the time on the subject and corrects many inaccurate and misleading impressions of his predecessors. But he confuses, like Charaka and Suśruta, bones with cartilage and ligaments. He had vague ideas about nerves (*neura*) and identified them with the tendons, arising from the heart and he regarded the aorta as the nervous vein (*neurodes phleps*). And the human anatomy was not studied with experimental observation and dissection before the famous Alexandrian schools attracted the best intellects of the age under the patronage of Ptolemy Soter (*B. C. 323-282*). Erasistratus and Herophilus were both celebrated anatomists of antiquity. They acquired a tolerably sound knowledge of the organs and their functions, not only by animal but also by human dissection and experimentation. Erasistratus found out that the nerves originated from

the brain and Herophilus distinguished them into those of sensation and voluntary motion. Herophilus also wrote a treatise on the liver, which Galen has transmitted among his writings. Galen (130-200 *A. D.*), the really accurate anatomist of antiquity, went to Alexandria to study medicine under the famous anatomist Heraclianus, and Claudius Galenus of Pergamum can be called the founder of exact medical science by his vast erudition, scholarly research and his accurate clinical observation, and no wonder, for generations, his writings have held unchallenged authority both in Europe and Asia. The Arabic schools of medicine regarded him almost as infallible.

Herodotus (*B. C.* 484-427) mentions in his history II. 85, that the Egyptian medical profession was very advanced and learned, and it specialized in different diseases. But there is nothing left but a fragment of papyrus of the sixteenth century *B. C.* to indicate the extent of the medical knowledge of the ancient Egyptians. In this papyrus, it is found that the heart, vessels, liver, spleen, kidneys, ureters and bladder were recognized and the blood-vessels came from the heart. Their vessels are described, some carrying air, some mucus, while two to the

right ear are mentioned to carry the breath of life and to the left ear, the breath of death. (*Journal of Anatomy and Physiology*, vol. XXXII. P. 775). Even in the third millennium B. C. the Babylonians possessed quite to a praise-worthy extent the knowledge of the liver which they regarded as the seat of life. The Chaldeans used the liver of the sacrificed sheep for the divination of events. In the code of Hammurabi about 1900 B. C. it seems that the Babylonian medical art had already attained a marvellous efficiency, as the operation on the eye is mentioned with bronze lancet as a regular professional daily business. And a successful eye operation is not possible without a thorough anatomical knowledge of its structure.

1. OSTEOLOGY

| Parts of the body. | Number of bones according to modern anatomical Text-books | (haraka | Saśuta | Hippocrates |
|--|---|----------------------|--------------------|-------------|
| I. Four Extremities. | | | | |
| Phalanges (<i>aṅguli</i>) | | | | |
| Bones of fingers and toes | $14 \times 4 = 56$, | $15 \times 4 = 60$, | $15 \times 4 = 60$ | |
| Metacarpus (<i>śulākā</i>) | | | | |
| Long bones of the palm | $5 \times 2 = 10$, | $5 \times 2 = 10$, | $5 \times 2 = 10$ | |
| Metatarsus (<i>śulaka</i>) | | | | |
| Long bones of the anterior portion of the foot | $5 \times 2 = 10$, | $5 \times 2 = 10$, | $5 \times 2 = 10$ | Hands 27 |
| Carpus (<i>1. adhiṣṭhāna</i> ; <i>2. kūrçhica</i> ; <i>3. gulpha</i>) | | | | |
| The wrist-bones | $8 \times 2 = 16$, | $5 \times 2 = 10$, | $5 \times 2 = 10$ | |
| Tarsus (<i>1. adhiṣṭhāna</i> ; <i>2. kūrçhica</i> ; <i>3. gulpha</i>) | | | | |
| Ankle-bones | $7 \times 2 = 14$, | $5 \times 2 = 10$, | $5 \times 2 = 10$ | Feet 24 |

| | | | | |
|--|------------------|------------------|------------------|----------|
| Os calcis (<i>pārṇi</i>) | | | | |
| Heel | $1 \times 2 = 2$ | $1 \times 2 = 2$ | $1 \times 2 = 2$ | |
| Styloid processes of the wrist (<i>maṇika</i>) | — | $2 \times 2 = 4$ | $1 \times 2 = 2$ | |
| Tibia and Fibula (<i>iaṅghā</i>) | | | | |
| The leg bones | $2 \times 2 = 4$ | $2 \times 2 = 4$ | $2 \times 2 = 4$ | |
| Radius and Ulna (<i>aratni</i>) | | | | |
| Bones of the forearm | $2 \times 2 = 4$ | $2 \times 2 = 4$ | $2 \times 2 = 4$ | |
| Patella (<i>jānu</i>) | | | | |
| Knee-cap | $1 \times 2 = 2$ | $1 \times 2 = 2$ | $1 \times 2 = 2$ | |
| Olecranon (<i>kūṛpara</i>) | | | | |
| Elbow process | — | $1 \times 2 = 2$ | $1 \times 2 = 2$ | |
| Femur (<i>uru</i>) | | | | |
| Thigh-bone | $1 \times 2 = 2$ | $1 \times 2 = 2$ | $1 \times 2 = 2$ | |
| Humerus (<i>bāhu</i>) | | | | |
| The bone of the upper arm | $1 \times 2 = 2$ | $1 \times 2 = 2$ | $1 \times 2 = 2$ | |
| | <hr/> 120 | <hr/> 122 | <hr/> 120 | <hr/> 51 |

* Included among the Tarsus bones.

II. The Trunk.

| Parts of the body | Number of bones according to modern anatomical Text-books | Charaka | Suśruta | Hippocrates |
|--------------------------------------|---|--------------------|--------------------|-------------|
| Clavicle (<i>akṣaka</i>) | | | | |
| Collar-bone | $1 \times 2 = 2$ | $1 \times 2 = 2$ | $1 \times 2 = 2$ | |
| Scapula (<i>aṃśa</i>) | | | | |
| Shoulder-blade | $1 \times 2 = 2$ | $1 \times 2 = 2$ | * $1 \times 2 = 2$ | |
| Sternum (<i>bakṣa</i>) | | | | |
| Breast bone | 1 | 17 | 8 | |
| Ribs [<i>pāśvaka</i>] | $12 \times 2 = 24$ | $36 \times 2 = 72$ | $36 \times 2 = 72$ | |
| Vertebrae : [<i>spinal column</i>] | | | | |
| 12 <i>Thoracic</i> | 17 | 35 | 30 | 20 |
| 5 Lumber } <i>prāṇe</i> | | | | |

* Enumerated among 'baksha.'

| | | | | |
|--------------------------|----|-----|-----|--------------------|
| Sacrum (<i>trika</i>) | 1 | 1 | 1 | |
| Coccyx (<i>guda</i>) | 1 | 1 | 1 | 5 |
| Ilium ; Ischium | | | | |
| (<i>śroni-phalaka</i>) | 2 | 2 | 2 | (<i>nitamba</i>) |
| Pubis (<i>bhaga</i>) | | 1 | 1 | |
| | 50 | 133 | 117 | 25 |

III. The Neck and the Skull

Vertebra Cervix (*grīvā*) 7 15 9 7

Trachea and Bronchi(*iātru*)

The Windpipe 1 4 (*kaṇṭhanālī*)

| | | | | |
|-----------|---------------------|---|--------------------|-------|
| Frontal | 1 | | | |
| Parietal | 2 (<i>chakṣu</i>) | 2 | | |
| Occipital | 1 | | (<i>mostaka</i>) | |
| Sphenoid | 1 | 4 | 6 | skull |
| Ethmoid | 1 | | | 8 |

| Parts of the body | Number of bones according to modern anatomical Text-books | Charaka | Suśruta | Hippocrates |
|---|---|---------|-----------|-------------|
| OS Temporale (<i>Śaṅkha</i>) | 2 | 2 | 2 | |
| Superior maxillary | 2 } (<i>hanu</i>) | | | |
| Inferior maxilla | 1 } | 2 | 2 | |
| { Ossa faciei : Nasal (<i>nāsikā</i>) | 2 } | 3 | 3 | |
| { Bones of the face. Vomer | 1 } | | | |
| Palate <i>tālu</i> | 2 | 2 | 1 | |
| Lachrymal | 2 | — | — | |
| Inferior turbinated | 2 | — | — | |
| Malar (<i>gaṇḍa</i>) | 2 | — | 2 | |
| Hyoid | 1 | * | | |
| The Ossicles of the ear : | | | | |
| Malleus | 3 × 2 = 6 | | | |
| Incus | | | | |
| Stapes | | | | |
| | | | 1 × 2 = 2 | |

* Enumerated among the 'grīvā.'

| | | | | |
|--------------------------------------|----|-----|----|----|
| Teeth (<i>lanta</i>) | — | 32 | 32 | |
| Sockets of teeth(<i>udūkkhala</i>) | — | 32 | — | |
| Nails (<i>nakha</i>) | — | 20 | 4 | 20 |
| | 36 | 105 | 63 | 35 |

ANATOMY

| | | | |
|-------------------------------------|-----|--------|--------|
| I. The Four Extremities | 120 | 120 | 51 |
| II. The Trunk | 50 | 153 | 25 |
| III. The Neck and the Skull | 36 | 105 | 63 |
| The total number of the human bones | 206 | 360(1) | 300(2) |
| | | | 111 |

“With teeth, sockets of teeth and nails, there are altogether 360 bones in the whole of the (human) body. As the following :—sockets of teeth 32 ; nails 20 ; long bones of hand and feet 20 ; their bases 4 ; bones of fingers 60 ; heels 2 ; bases of the feet 2 ; wrist bones 4 ; ankle-bones 4 ; in the fore-arms 4 ; in the leg 4 ; knee-caps 2 ; elbow-pans 2 ; in the thighs 2 ; in the arms 2 ; collar bones 2 ; shoulder-blades 2 ; palate bones 2 ; the pelvic ring 2 ; ilium 1 ; sacrum 1 ; coccyx 1 ; back-bone 35 ; neck-bones 15 ; trachea 1 ; jaw bones 2 ; bases of the jaw bones 2 ; parietal 2 ; malar 2 ; nasal bones 3 ; ribs ; 24 ; thoracic ribs 24 and sockets of the ribs 24 and altogether on the sides 72 bones ; temporal bones 2 ; frontal cranium 4 ; breast bones 17 ; altogether three hundred and sixty bones.” Charaka IV.7.4.¹

1. Charaka IV. 7. 4 त्रीणि वट्यधिकानि शतान्यष्ट्यां सङ्गदन्तोलूखलनखैः । तद्यथा,— दानिं शङ्खोलूखलानि, दानिं शङ्खान्, त्रिंशतिर्नखाः, त्रिंशतिः पाणिपादशलाकाः, चत्वार्यधिष्ठानान्वासां, चत्वारि पाणिपादपृष्ठानि, षट्पञ्च-ख्यस्थीनि, हे पार्श्वोर्ध्वे कूर्चाधस्तारः पाश्वोर्ध्विकास्तारः पादयोर्गुल्फाः, चत्वार्य-रज्जोरस्थीनि चत्वारि जङ्घयोर्जङ्गुनोर्ध्वे कूर्परयोर्ध्वे ऊर्ध्वोर्ध्वे वाक्त्रोः संसयोः दानचक्री, हे तासुनि, हे श्रोणिफलकौ, एकं भगास्थि, पुंसां मीढ्रास्थि, एकं त्रिकर्णश्रितमेकं गुदास्थि, पृष्ठगतानि पञ्चत्रिंशत्, पञ्चदशास्थीनि ग्रीवायां, हे जङ्गुस्थौ कं हृन्स्थि, हे हनुमूलवन्धने, हे ललाटे, हे अश्वोर्ध्वे हे गन्धयोर्ना-सिकायां त्रीणि धोषास्थानि, इयोः पार्श्वयोश्चतुर्विंशतिश्चतुर्विंशतिः पञ्चरास्थीनि च पार्श्वकानि तावन्ति चैषां स्थालिकान्यब्जदाकाराणि, तानि त्रिसप्ततिर्धौ शङ्खकौ, चत्वारि शिरःकपालानि पञ्चसि सप्तदशेति त्रीणि वट्यधिकानि शतान्यष्ट्यांमिति ।

"According to the medical men, there are 360 bones, but in surgery 300 bones are enumerated. Of these 300 bones, in the branches, that is in both the arms and feet, there are 120 ; in the pelvic region, back and the breast, there are 120 ; and above the trunk 63 : altogether there are 300 bones in the human body.

"Following are the 120 bones in the branches :—at every finger of the foot, there are 3—so 15 ; the foot-support (*metatarsus*), the ankle-bones and their base 10 ; heel 1 ; in the leg 2 ; in the knee-cap 1 ; in the thigh 1 ; so in one foot there are 30 bones : so in the other foot and arms.

"In the pelvis 5 as coccyx, ilium, pubis 4 and sacrum 1 ; ribs 32 one side and the same on the other ; back-bones 30 ; in the breast 8 ; shoulder-blades 2.

"In the neck 9 ; in the wind-pipe 4 ; jaw-bones 2 ; teeth 32 ; in the nose 3 ; palate 1 ; malar, temporal and ear bones 2 each ; in the cranium 6." *Suśruta* III. 5. 17-20. "

Suśruta III. 5. 17-20 वीणि सषष्टीन्स्थितानि वेदवादिनी भाषन्ते । शल्यतन्त्रे तु दौष्ट्येव श्रुतानि । तेषां सविंशत्यस्थिषु शाखास्तु । समदशोत्तरं शतं शोणिषांष्ट्रष्टोदशोत्तरसु । येषां प्रत्यूहं विषष्टिः । एवमस्थ्यां वीणि श्रुतानि पूर्यन्ते ॥ १७

एकैकस्थानु पादाङ्गुल्यां वीणि वीणि,—तानि पञ्चदश । तलङ्गुलङ्गुलफलङ्गुलानि दश । पाष्ठांमिकम् । अङ्गुयां द्वे । जानुन्येकम् । एकमूराविति त्रिंशद्वेनैकस्थिन् सकथयि भवन्ति । एतेनेतरसकथिबाङ्ग च व्याख्यातौ ॥ १८

शोष्ठां पञ्च, तेषां शुद्धभग्नितन्त्रेषु चत्वारि, त्रिकसंश्रितनैकम्, पाष्ठांष्ट्रविंशद्वेनैकस्थिन् ; द्वितीयोऽप्येकम् । दृष्टे त्रिंशत् । अष्टाशुरसि । द्वे अष्टकसंश्रिते । १८

शोवायां नवकम् । कण्ठनाद्यां चत्वारि । द्वे हृन्तोः । दन्ता द्वाविंशत् । नासायां वीणि । एकं तालुनि । गण्डकण्ठशङ्खेकैकम् । षट् शिरसि ॥ २०

"The bones of the hand are 27 ; of the feet 4 ; of the neck up to the grand (*back-bone—shoulder blades*) 7 ; pelvis 5 ; back-bones 20 ; the head with eyes 8 ; in total 91 with the nails 111. As to man, the bones we have ourselves learnt to know are :—the back-bones above collar-bones with the grand (*shoulder-blades*) 7 ; the back-bones as well as those of the sides (*ribs* 12 ; *the back-bones that go farther the ribs in the pelvis* 5.") Hippocrates : *The Nature of Bones*, I. (*Peri osteon physios*).

From the above comparative table, it is evident that the Hindu anatomists, especially the Suśruta school, had a tolerably sound knowledge of **osteology**. The discrepancies in the figures are due to the fact that the Hindus counted the processes, cartilaginous structures and the teeth as bones. But they classified the bones into five kinds according to their nature of constitution. (*Suśruta III. 5. 21*). The nails—the epidermal formations were dismissed by Suśruta as bones. If the teeth were counted in the skeleton, it is because the teeth are bone-like, hard and strong. Histology is a recent science and it could not be known in ancient times that tooth is a calcified papilla of the mucous membrane. If the cartilages, especially

the costal cartilages of the ribs have been counted as the bones, it is because in the embryonic state all the bones are in cartilaginous condition and in certain diseases, the costal cartilages become ossified. Suśruta counts 30 as the dorsal and the lumbar vertebrae, for the reasons that the spinal column really consists of 33 irregular bony segments of which the upper 24 are separated during life by discs of spinous cartilaginous articular processes, and are therefore called "true" or "movable" vertebrae, in distinction from the lower 9 which are called the "false" or "fixed" vertebrae, for they become consolidated into the sacrum and the coccyx. The Hindu anatomists counted the constituent bones of the sacrum and the coccyx as separate bones as well as the spinous processes, belonging to the vertebrae. While the modern anatomists designate as vertebrae the upper 24 loose bones, consisting of the 'cervical' 7, 'dorsal' or 'thoracic' the succeeding 12, and the 'lumbar' the lower 5. The Hindu anatomists enumerated the cervical vertebrae as the 'grīvā' or neck bones, adding also to it the hyoid bone. In the wind-pipe (*kaṇṭhanālī*) the four cartilages—cuneiform, arytenoid, thyroid and cricoid, were counted as bones. The

breast-bone is given by Suśruta to be 8, for he includes among the breast-bones the 2 collar bones and as the sternum really consists of three parts, the 'manubrium' which usually remains separate throughout life from the rest of the bone, the cartilaginous 'metasternum' and the 'corpus sterni' or 'mesosternum' which is formed by the fusion in early life of four segments.

So if we try to identify the nomenclature and designation of the ancient Hindu and the modern systems of osteology, it becomes clear that the Hindus had acquired a sound knowledge of the human skeleton. And the term 'skeleton' (*from the Gr. skeletos = dried*) is applied to the parts which remain after the softer tissues of the body have been disintegrated or removed and includes not only the bones, but also the cartilages and ligaments which bind them together (Cunningham : *Anatomy*, p. 67). In this generic sense the Hindus described their bony frame-work, but classified the bones into five kinds according to their composition as flat (*kapāla*), tooth (*ruchaka*), tender (*taruṇa*), strong (*balaya*) and hollow (*nalaka*) bones.

(3) "These bones are of five kinds as the following:—'flat' bones, 'tooth' bones, 'tender' bones,

'strong' bones and 'hollow' bones. The bones of the knee, pelvis, shoulder, malar, palate and the head are flat bones. The teeth are of 'tooth' bones ; the nose, ear, neck and the eyesockets are of 'tender' bones. Those of the hand, foot, sides, back and breast are of 'strong' bones. The rest of the bones are 'hollow'." *Suśruta* III. 5. 21. *

11. ARTHROLOGY.

In *Arthrology*, that is, in the description of the articulations or joints (*Sandhi*), *Suśruta* shows also remarkable accuracy. "Joints are of two kinds—'movable' (*diarthroses*) and unmovable (*amphiarthroses*). In the four branches (*hands and feet*), in the jaw-bones and the loin, the joints are movable and the rest of the joints, the wise should regard as permanent (that is, of partial or incomplete movement).

"There are 200 joints in the body. Of them 68 are in the four extremities, 59 in the trunk and 83 above the shoulder (that is, in the neck and the head).

(3) एतानि पञ्चविधानि भवन्ति । तद्यथा—कपालरुचकतरुचकवलयनलकसंज्ञानि । तेषां जातुनितम्बांसगण्डतालुशङ्खशिरःसु कपालानि । दशनास्तु रुचकानि । घ्राणकर्ण-श्रोत्रालिकीविषु तरुचकानि । पाणिपादपार्श्वपृष्ठीदरीरःसु वलयानि शिषाणि नलक-संज्ञानि ॥ २१ *Suśruta* III. 5, 21.

"In every toe there are 3, except the great toe (corresponding to the thumb) which has two joints, thus $14(4 \times 3 + 2 = 14)$. The knee, ankle and hip has each a joint. So one foot has 17 joints ; the other foot likewise, as well as both the arms.

"In the pelvis 3 ; in the spinal column 24 ; in the sides (*ribs*) 24 ; in the breast 8 ; in the (*vertebral-cervical*) neck 8 ; in the trachea 3 ; in the conjunction joints of the heart and lungs 18 (*hrdayaklomanibaddha*) ; in the sockets of teeth 32 ; 1 in the thyroid cartilage (*kākalaka*) and one in the nose ; 2 between the eye-sockets and the eye-balls (*dvau vartmamandāu netrāśrayau*). In the malar, temporal and the ears 6 ; in the jaw bones 2 ; on the top of the brows 2 ; in the cranium 5 and 1 in the forehead.

"These joints are of eight kinds as:—gynglymoid (*kora*—a hinge joint), enarthrodial (*udūkhala* = mortar-like in shape ball-and-socket joint), enarthrodial (*sāmudga* = cup-like), costo-vertebral (*pratara* = raft-like), circular (*mandala*), sutural (*tunnasevanī* = sewing) and symphysic (*conch-shell like*) joints. Interphalangeal (*gynglymus*-simple hinge joints, surrounded by a capsule), radio-carpal (*condyloid-ellipsoidal*), the ankle-joint (*gynglymus*), the knee-joint (*gynglymus*), the elbow-joint (*gynglymus*) are all '*kora*'; the shoulder-joint

(*enarthrodial-ball-and-socket-joint*), the hip-joint (*enarthrodial*), teeth-sockets (*synarthrodial-immovable ?*), are all '*udūkhala*'; the sterno-clavicular joint (*diarthrodial-freely movable*), sacro-iliac joint (*diarthrodial*), symphysis pubis (*amphidiarthrodial*—a combined gliding and hinge joint), and lumbo-sacral joints (*amphidiarthrodial*) are all (*sāmudga*); cervical, dorsal and lumbar vertebral joints (*limited amphidiarthrodial*) are '*pratara*'; the temporal and the cranium joints (*sutural*) are *tunna-sevani*; trachea, heart, eye and lung-joints are *maṇḍala*; the ear and the nose joints (*symphysic*) are *śankhāvartta*. According to the shape of the joints nomenclature has been fixed. Only the joints of the bones have been described. The joints of the muscles, nerves and arteries are countless". *Suśruta* III. 5. 23-29^{3a}

3a. शाखासु हन्वीः कव्याश्च चेष्टावन्तस्तु सन्धयः ।

शेषास्तु सन्धयः सर्व्वे विज्ञेया हि स्थिरा वृधेः ॥ २२

सङ्गतास्तु दशोत्तरे द्वे शते । तेषां शाखास्तदष्टष्टिः, एकोनषष्टिः कोष्ठे, योषां प्रत्यङ्घ्रं द्वाशीतिः ॥ २३

एकैकस्यां पादाङ्गुल्यां त्रयस्त्रयः, हावङ्गुष्ठे,—ते चतुर्दश । जानुगुल्फवङ्गुष्ठे-
ष्वेकैकः । एवं सप्तदशैकस्त्रिंशन् सक्थानि भवन्ति । एतेनेतरसक्थिवाङ्गु क
व्याख्यातौ ॥ २५

त्रयः कटीकपालिषु । चतुर्विंशतिः वृद्धवंशे । तावन् एव पार्श्वयोः उदरस्वटी ।
तावन् एव योवायाम् । त्रयः कण्ठे । नाडीषु त्रयस्त्रिंशन्निषणास्तदष्टष्टिः ।
दक्षपरिमाणा दन्तमूलीषु । एकः काकलकी नासायाश्च । द्वौ वल्गुमङ्गुली नैवात्रयौ ।

III. Myology

In myology, the muscular system, though Sūsruta at first appears to be fantastical and vague, yet by comparative study, it can be easily seen that notwithstanding imperfection and clumsiness, there is some fundamental truth in the statement. Sūsruta mentions 500 muscles (*peśi*) while Steadman's Medical Dictionary gives the names of 427 muscles. It is possible that Sūsruta duplicates many continuous muscles and omits many deep-underlying muscles, especially of the upper part of the body.

Muscles according
to Sūsruta.

Muscles according to
Cunningham's
Anatomy.

I. The Lower Exremity

| | | | |
|--------------|------------|-------------------------------|----------------------|
| Toe | 3 × 5 = 15 | 3 | } Leg and foot 25 |
| Fore foot | 10 | 7 | |
| Ankle & Sole | 10 | 9 | |
| Heel | 10 | 2 tendons and 2 ligaments. | |
| Leg | 20 | 12 | |
| Knee | 5 | 3 tendons and 4 ligaments. | } 25 |
| | | | |

गण्यकर्णशङ्खे कौकः । शी हन्सन्धी । दादुपरिष्ठाद्भुवोः । शङ्खयोय । पञ्च
शिरःकपालेषु । एको मूर्ध्नि ॥ १६।१७

त एते सन्धयोऽष्टविधाः । कोरीदूखलसामुद्रप्रतरतुन्नसेवनीवायसतुल्यमखलशङ्का-
वर्त्ताः । तेषामङ्गुलिमण्डिबन्धगुल्फजानुशूर्परेषु कोराः सन्धयः कक्षावङ्गणदशनेषु-
दूखलाः । अक्षपीठगुदभगनितन्त्रेषु सामूहाः । शीवापृष्ठवर्धयोः प्रतराः शिरःकटीकपालेषु
तुन्नसेवनी । हन्वीरुभयतस्तु वायसतुल्यः । कण्ठद्वयनेवलोमनाफीषु मखलाः
योवमङ्गाटकेषु शङ्कावर्त्ताः । तेषां नामभिरेवाह्वयतयः प्रायेण व्याख्याताः ॥ १८

अस्यान्तु सन्धयो ह्येते केवलाः परिकीर्त्तिताः ।

पेशीन्नायुशिराणान्तु सन्धिसङ्ख्या न विद्यते १८

| | | | |
|-------|-------|----|-------------|
| Thigh | 20 | 22 | Thigh and |
| Groin | 10 | 8 | buttock 25 |
| | | | and 2 liga- |
| | | | ments. |
| | <hr/> | | |
| | 100 | | |

II. The Trunk of the Body

| | | | |
|----------------|-------------------|-----------------|--|
| Pelvic region | 3 | 2 | Ischio-coccygeus and Levator Ani; but the 'Levator ani' is divisible into 4 parts. |
| Penis | 1 | Erector penis 1 | Perineum 12 |
| Spermatic cord | 1 | 1 | Spermatic cord passing through 'cremaster' muscle. |
| Testes | 2 | 1 | Dartos muscle in scrotum. |
| Bladder | 2 | 1 | Compressor Urethrae |
| Stomach | 5 | Thorax 12 | Anterior muscles of the Trunk 19 |
| Breast | 10 | | |
| Abdomen | 6 | | |
| Navel | 1 | | |
| Shoulder | 7 | 5 | |
| Back | 16 | 16 | There are 16 superficial and 15 deeper muscles in the back. |
| Buttocks | $2 \times 5 = 10$ | 8 | |

| | | | |
|-----------------|---|---|--|
| Heart and Colon | 2 | 3 | myocardium and mas- culi papillares tunica muscularis (colon). |
|-----------------|---|---|--|

III. The Neck and the Head.

| | | | |
|------------------------|-------------------------------------|----|---|
| The back neck | 4 | 6 | |
| Jaws | $2 \times 4 = 8$ | | |
| Thyroid | $1 \times 2 = 2$ | | Thyro-hyoid, Stylo-hyoid and Sterno-hyoid. |
| Tongue | 1 | | or 8. The 'extrinsic mus- cles': genio-glossus, hyo- glossus, styloglossus and palato-glossus. The 'in- trinsic muscles': supe- rior lingualis, inferior lingualis, transverse fi- bres and vertical fibres. |
| Cheeks | $1 \times 2 = 2$ | 5 | The mouth 11 (eleven) |
| Nose | 2 | 5/ | |
| Front neck | $2 + 2 = 4$ | 10 | |
| Eye | $1 \times 2 = 2$ | 7 | in the orbit and 4 in the eye-lids. |
| Forehead | 4 Front- alis | 1 | |
| Palate | 2 Occipi- talis and Trapezius | 2 | The scalp 6 |
| The top of the head | 1 | | Epicranial Aponeurosis |
| Ear | 2 | 3/ | |

IV. The Female Reproductive Organs

| | | | |
|----------------|-------------------|-------------|---|
| Mammæ | $5 \times 2 = 10$ | 5 | Pectoralis major, serratus magnus, ligaments of Cooper, aponeurosis and recto abdominis muscles. |
| Vagina | $2 + 2 = 4$ | $2 + 3 = 5$ | Tunica muscularis, rugæ vaginales, and (common bulbo cavernosus, sphincter ani,externeus levator ani and erector clitoridis = erector penis). |
| Uterus | 3 | 3 | Ligamentum latum uteri (broad ligament), ligamentum teres uteri (round ligament) and the muscular 'corpus uteri'. |
| Fallopian tube | 3 | 3 | Tunica muscularis, ligamentum ovarium proprium and mesovarium. |

"There are 500 muscles [*peši*]. 400 of them are in the 4 extremities, 66 in the trunk, and 34 above the shoulder (in the neck and the head).

“The toes (*pādāṅguli*) of each foot have 15 muscles, having 3 muscles for each toe ; 10 in the fore-foot (*pādāgre*) ; 10 in the heel (*kūrcha*) ; in the ankle and the sole (*gulpha-talayoh*) 10 ; between the ankle and the knee (*gulpha-jānvantare* = *leg*) 20 ; 5 in the knee (*jānu*) ; 20 in the thigh (*uru*) ; 10 in the groin (*vaṅkṣāṇa*) : thus in one foot there are 100 muscles ; so in the other foot and the two arms.

“In the pelvis (*pāyu*) 3 ; in the penis (*medhre*) 1 ; in the spermatic cord (*sevani*) 1 ; in the testes (*vrṣaṇ*) 2 ; in the buttocks (*sphicha*) 5 each ; in the upper part over the bladder (*vasti-sirasi*) 2 ; 5 in the stomach (*udara*) ; in the navel (*nābhi*) 1 ; in the upper back (*prsthordha*) 5 longitudinal (*muscles*) on each side ; in the sides (of the spinal column = *pārśva*) 6 ; 10 in the breast (*Vakṣa*) ; in the shoulder (*akṣakāṁsa*) 7 ; 2 in the heart and colon (*hrdayāmāśaya*) ; 6 in the spleen, liver and the lower intestine (*yakṛt-plihā-uṇḍuka* = *abdomen*).

“In the back part of the neck (*grīvā*) 4 ; 8 in the jaws (*hanu*) ; in the thyroid cartilage (*kākalaka*) 2 ; in the palate (*tālu*) 2 ; in the tongue (*jihvā*) 1 ; in the cheeks 2 ; in the nose (*ghoṇa*) 2 ; 2 in the eyes (*netra*) ; in the front neck (*gaṇa*) 4 ; in the two ears (*karna*) 2 ; 4 in

the forehead (*lalāṭa*), and 1 (*one*) on the top of the head (*śirasi*).

"A woman has 20 more muscles than man : 10 in the two mammæ (*stana*) at 5 each, which are developed in adolescence ; in the vagina (*apatyapatha*) 4, two in the entrance and two in the interior ; in the uterus (*garbha-cchidra*) 3 and in the fallopian tubes (*śukrārttava-praveśa*), the muscles are 3.

"According to the position, the muscles are grouped together (*vahula*), isolated (*pelava*), thick (*sthūla*), thin (*sūkṣma*), extensive (*prthu*), globular (*vṛtta*=*tendon*), short (*hrasva*), long-cylindrical (*dirgha*), hard (*sthira*), soft (*mṛdu*), smooth (*ślakṣṇa*=unstriated, that is primitive involuntary muscles), striated (*karkaśa*=voluntary muscles with transverse stripes), and they cover the joints, bones, arteries and nervous fibres according to their respective needs.

"The muscles that have been mentioned of men in their penis and testicles, cover in women their interior reproductive organs."
Suśruta III. 5. 37-45.⁴

4. पञ्च पेशीयतानि भवन्ति । तासां चत्वारि यतानि शाखासु । कोष्ठे षट्षष्टिः । बीजां प्रत्युर्ध्वं चतुस्त्रिंशत् ॥ ३७

एकैकास्यान्तु पादाङ्गुल्यां तिस्रस्तिस्रस्ताः पञ्चदश । दश प्रपदि । पादोपरि त्र्यर्धचतुर्विंशत्यासावत्य एव । दश गुल्फतलयोः गुल्फज्जान्वन्तरि द्विंशतिः । पञ्च आङ्गुलि ।

The difference between Suśruta's 500 muscles and Stedman's 427 muscles, which if counted separately like Suśruta on both sides of the body would amount to nearly 800 muscles, can be easily accounted for by the fact that not only the modern classification and nomenclature of the muscles are different from the

विंशतिहरी । दश वङ्गवे । शतमेवमेकस्मिन् सक्त्वाणि भवन्ति । एतेनेतरसक्त्वाणिवाह
च व्याख्याती ॥ ३८

तिस्रः पाथी । एका मेढ् । सेवन्वाद्यापरा । हे हवचयोः । चिकीः पञ्च
पञ्च । हे वसिष्ठिरसि । पञ्चोदरे । नाभ्यामेका । वृद्धोर्ध्वसन्निविष्टाः पञ्च पञ्च दीर्घाः ।
वट् पार्श्वयोः । दश वङ्गसि । चक्षुर्कासी प्रति समन्तात् सम । हे हृदयामाश्रयोः ।
वट् यज्ञतृतीकोष्ठुकेषु ॥ ३९

घोषायां चतस्रः । चट्टी हन्वीः । एकौका काकलकगलयोः । हे तालुनि ।
एका जिह्वायाम् । ओष्ठयोर्ध्वे । घोषायां हे । हे नेत्रयोः । गच्छयोश्चतस्रः । काश्वयोर्ध्वे ।
चतस्रो कलाटे । एका शिरसि हृदयेवमेतानि पञ्च पेशीयतानि ॥ ४०

शिरास्त्राय स्थिपर्व्याणि सन्धयश्च शरीरिणाम् ।

पेशीभिः संवृतान्यत्र बलवन्ति भवन्त्यातः ॥ ४१

स्त्रीणाम् विंशतिरधिका । दश तासां स्नयोरैकैकस्मिन् पञ्च पञ्च, यौवने तासां
परिहृदिः । अपत्यपथे चतस्रः, तासां प्रसृतेऽभ्यन्तरतो हे, सुखान्त्रिते बाह्वे च प्रहृते
हे । गर्भेऽष्टद्वयत्रितासिक्तः । शुक्रार्तवप्रवेशिन्यसिक्त एव ॥ ४२

पितृपक्षाश्रयमध्ये गर्भाशयो यत्र गर्भसिष्ठति ॥ ४३

तासां बहुलपेलवस्त्र्वास्तुपुष्टकस्त्र्वादर्धस्त्र्वास्तुद्वयस्त्र्वास्तुकोशभावाः सन्ध्यास्त्रि-
शिरास्त्रायुप्रवृद्धादका यथादिशं स्वभावत एव भवन्ति ॥ ४४

भवति चात्र—पुंसां पेश्यः पुरसाद्याः प्रोक्ता लक्षणानुसृज्याः ।

स्त्रीणामहंन्य तिष्ठन्ति फलमन्तर्गतं हि ताः ॥ ४५ ॥

ancient Hindu system, but Suśruta did not include the tendons (*māṃsa-rajjū*) and ligaments (*śimanta*) in the muscular order. It is evident from close comparative study that the Suśruta school of anatomy had tolerably sound knowledge of the human muscular system for all practical purposes.

Suśruta mentions 14 joints of more than 2 bones (*saṃghāta*) which are held together by a band or sheet of fibrous tissue, which he calls '*śimanta*' that is ligament. He enumerated them in the following junctions :—“Three are in each foot at the ankle (a joint of *tibia*, *fibula* and *astragalus*, held together by,—*anterior tibio-fibular ligament*, *posterior tibio-fibular lig.*, *talo-fibulare anterius*, *calcaneo-fibulare*, *talo-fibulare posterius* and *ligamentum deltoideum*), at the knee (a joint of the *femur*, *tibia*, capped by the *patella*, held together by *ligamentum patellae*, *lig. Posticum Winslowii*, *lig. collaterale tibiale*, *lig. collaterale fibulare* and *ligamenta cruciata genu*), at the hip-joint (of the *femur*, *ilium* and *pubis*, held together by *lig. Transversum acetabuli*, *lig. ilio-femorale*, *lig. pubo-femorale*, *lig. ischio-capsulare*, and *lig. teres femoris*); so in the arms at the wrist (a *radiocarpal articulation* between the *radius* and the

scaphoid, semilunar and cuneiform bones, held together by the external lateral ligament, internal lateral ligament, anterior and posterior ligaments), at the elbow (a joint of humerus, radius and ulna, held together by the anterior and posterior ligaments, lig. collaterale ulnar and lig. collaterale radiale), and at the arm-pit (the shoulder-joint of the head of the humerus, glenoid fossa of scapula and the coracoid process, held together by labrum glenoidale, capsula articularis and ligamentum coraco-humerale). According to others, there are 18 (ligaments). The above-mentioned 14, one at the pelvis (sacro-iliac joint of sacrum, ilium and pubis, held together by lig. sacro-iliacum anterius, lig. sacro-iliacum posterius breve, lig. sacro-iliacum posterius longum, lig. ilio-lumbale, lig. sacro-tuberosum, lig. sacro-spinosum, lig. pubicum posterius, anterius, superius and inferius), at the upper-breast (sterno-clavicular joint of the sternum and clavicles held together by lig. sterno-clavicularis and lig. rhomboidale) and the lower-breast (sterno-costal joints of the sternum and the seven costal cartilages held together by lig. costo-sternalium radiatum, ligg. sterno-costalia interarticularia) and at the neck (scapulo-clavicular joint held together by lig. coraco-claviculare, lig.

conoideum and *lig. trapezoideum*) *Suśruta* III. 5. 15-16^a

It is very likely that *Suśruta* by '*śimanta*' means only the synovial capsule and the membrane which are usually found at the joint of more than two bones and which he calls '*saṃ-ghāta*'. By the general term '*sandhi*' he has designated the articular joint and which he has enumerated as 210 and the fibrous band which binds the bones at the joints together (*ligament*) and the muscles to the bones (*tendons*), whether it is ligamentous or tendonous, he calls by the common designation '*snāyu*'-'to bind' and which he describes to be nine hundred (III. 5. 30.) And the large and strong tough fibrous longitudinal bands and chords are called '*kaṇḍara*'.

"*Kaṇḍaras* are 16 : 4 in feet (*tendo achilis* in the leg and *semimarbransus tendon* in the thigh), 4 in the arms (*supinator longus tendon* in the forearm, and the *semilunar* or *biceptial fascia tendon* in the arm,) 4 in the neck (*sterno-cleido-mastoid tendon*, *membrana tectoria*, *membrana atlanto-occipitalis posterior*, *lig. cruciatam atlantis*

5. चतुर्द्वाष्ट्यां सङ्गताः । तेषां त्रयो गुल्फजानुवङ्चयेषु । एतेनेतरसकषिवाह
च व्याख्याती । त्रिकशिरःपेरिकैः ॥१५॥

चतुर्द्वाष्ट्येव समन्ताः । ते चास्त्रिसंघातवद्गणनीयाः, यतस्तैर्युक्ता अस्त्रिसङ्घाताः ।
ये ह्यङ्गताः सङ्गतास्तु खल्वङ्गदार्थकेषाम् ॥१६॥

with *crus superius* and *inferius*), 4 in the spinal column (*lig. longitudinale anterius*, *lig. longitudinale posterius*, *lig. flaxum*, and *lig. supraspinale*). The terminals of the 'kandaras' of the hand and feet are in the nails; those of the neck passing through the heart terminate in the sexual organ (*medhra*) and those of the spinal column passing through the pelvis terminate in the pubis." *Suśruta* III. 5. 10.^{5a}

Suśruta Ligaments
 Tendons

1. The Extremities.

| | | | |
|--|-------------------|---------------|---|
| Toe | $5 \times 6 = 30$ | $27 + 5 = 32$ | Palmar band lig collateralia and synovial membrane at each interphalangeal joint, 2 in each toe and 1 in the large toe ($2 \times 4 + 1 = 9$) and 5 dorsal extensor tendons. |
| Ankle | } 30 | 18 | 5 Four ligaments and one synovial membrane |
| Heel | | | 5 Five tendons. |
| Sole | | | intratarsal ligg. and 10 s. membrane. |
| Leg | 30 | 28 | |
| Thigh | 40 | 34 | |
| Hip-joint | 10 | $8 + 1 = 9$ | |
| Knee-joint | 10 | $7 + 3 = 10$ | |
| <u>$150 \times 4 = 600$</u> | | | |

5a. षोडश कण्ठराः ; तासां चतस्रः पादयोस्तावत्यो हस्तयोवाष्टौ च । तत्र हस्तपाद-
गतानां कण्ठराणां गन्धाः प्रतीक्षाः । शीवाहृदयनिबन्धिनीनामधोभागगतानां मीटम् ।
श्रीषिष्टनिबन्धिनीनामधोभागगतानां विन्धः । मूर्ध्नोऽवसोऽसपिष्ठादीनाञ्च ॥१०

II. The Trunk.

| | | | |
|--------------------|----|----|---|
| Loia. | 60 | 18 | |
| Back-bone | 80 | 71 | Lig. interspinalia, lig. supra-spinalia, lig. flava—vel subflava and synovial membrane for each of the 12 thoracic and 5 lumbar vertebrae and 3 common ligaments for all. |
| Sides (24 ribs) | 60 | 72 | Lig. capituli costae radiatum, lig. capituli costae interarticulare and synovial membrane for each of the 24 costo-vertebral articulations. |
| | 30 | 56 | Lig. costo-sternalium radiatum, lig. costoxiphoidea, lig. sternocostalia interarticularia and the posterior costo-sternal ligament for each of the 14 ribs (7 pairs) |

III. The Neck and the Head.

| | | | |
|-------|------------|----|---|
| Neck | 36 | 52 | 4 Ligaments for each of the 7 cervical vertebrae, sterno-clavicular 12 and acromo-clavicular ligaments 12. |
| Head | 34 | 31 | Occipito-atloid joints 2 and each is provided with 8 ligaments, membrana atlanto occipitalis anterior, membrana occipitalis posterior, membrana tectoria, lig. cruciatum atlantis, lig. alaria, lig. apicis dentis, capsular ligament and synovial membrane; atlo-axoid joints are three, each supplied with 5 ligaments, lig. transversum atlantis, capsular, anterior and posterior atlo-axoid ligaments and synovial membrane. |
| Total | <hr/> 900° | | <i>Suśruta</i> III. 5, 30—32° |

6. नव ज्ञायुशतानि । तासां शाखासु षट् शतानि । इ शते त्रिंशच्च कोटि ।
 योवां प्रत्युहं सप्ततिः ॥३०

एकैकस्यान्नु पादाङ्गुल्यां षट् निचितासालिंशत् । तावत्य एव तलङ्गुल्लङ्गुलेषु ।
 तावत्य एव जङ्घायाम् । दश आनुनि । चत्वारिंशद्वरी । दश वडचण्ये । शम्भ-
 वंनैवनीकस्त्रिं सक्थनि भवन्ति । एतेनेतरसक्थिवाहू च व्याख्याती ॥३१

षट्तिः कव्याम् । अशीतिः ५० । पार्श्वयोः षट्तिः । सरसि त्रिंशत् ॥३२

It will be noticed that there is a marked discrepancy between the two figures. And it may be due to the different methods of calculation and classification, or it is possible that by '*snāyu*,' Charaka and Suśruta meant something entirely different from the ligament and the tendon. The general tendency of the Sanskrit scholars is to regard '*snāyu*' as nerve. But this is contradicted by its etymological derivation from '*snū*' or '*si*', to bind and the Suśruta mentions 210 joints, but does not say anything anywhere else of the binding material that holds them together excepting of 14 '*sīmanta*' at the junction of more than two bones (*saṃghāta*).^{*} He could not possibly omit to mention the binding material of the rest of the joints, when he has been minute in every other detail. And moreover the internal evidence tends to prove that he meant by '*snāyu*', ligaments and tendons as he says :—"*Snāyus* are of four kinds—branching (*pratānavatī*), globular (*ortta*), extensive (*prthu*) and perforated (*śuṣira*.) The '*snāyus*' in the four branches and joints are branching ; '*kaṇḍaras*' (the large *snāyus*) are globular; the '*snāyus*' of the anterior parts of the stomach, intestine and the bladder are perforated ; the '*snāyus*' of the sides, breast, back-bone and the head are extensive.

“As a boat of wooden planks well tied by many knots, can bear the weight of animals and goods in water, so a man can carry weight as his joints are knotted together by ‘*snāyus*’. The body does not suffer as much by the destruction of the bones, muscles or joints as by the destruction of ‘*snāyus*’. The physician that knows well the internal and superficial ‘*snāyus*’ can only extract from the body, the deeply impregnated missiles”. “*Suśruta* III. 5. 34-36.”

“The flesh (of the body) being tied to the bones by vascular system and ‘*snāyus*’, do not tear out and fall down”. *Suśruta* III. 5. 22.”

7. आयुश्चतुर्विधा विद्यात् तास्तु रुग्णां निबोध मे ।

प्रतानवत्यो वृत्ताश्च पृष्ट्वाश्च शुचिरासथा ॥३४॥

प्रतानवत्यः शाखास्तु सर्वसन्धिषु चाप्यथ ।

वृत्तास्तु कच्छराः सर्वा विज्ञेयाः कुशलेरिह ॥

आमपक्वाशयाग्नेषु वशी च शुचिराः खलु ।

पार्श्वोरसि तथा पृष्ठे पृथुलाश्च शिरस्थय ॥३५॥

नीर्यथा फलकाक्षीणां बन्धनैर्बहुभियुक्ता ।

भारक्षमा भवेदपसु द्युक्ता सुसमाहिता ॥

एवमेव शरीरेऽस्मिन् यावन्तः सन्धयः स्मृताः ।

आयुर्भिर्बहुभिर्दृष्टास्तेन भारसङ्घा नराः ॥

न ह्यस्थीनि न वा पेश्यो न शिरा न च सन्धयः ।

व्यापादितासथा ह्यन्यथा आयुः शरीरिणम् ॥

यः आयुः प्रविजानाति वाच्यान्वाभ्यन्तरासथा ।

स गूढं शल्यमाहर्षुं देहाच्छक्नोति देहिनाम् ॥३६॥

8. मांसान्धनं निवहानि शिराभिः आयुर्भिसथा ।

अस्थीव्यालम्बनं कृत्वा न शीर्यन्ते पतन्ति वा ॥२२॥

IV.—The Vascular System.

The *vascular system* (*Sira* = tubular vessel) is no less difficult, rather more so, as it defies all human ingenuity to describe it in tabulated figures. For the arteries bifurcate into branches and twigs, and spread out all over the body in infinite shape and size; the veins commence at the terminations of the capillaries and as they converge towards the heart, they form larger and still larger vessels, uniting with one another until finally seven large trunks empty their contents into the auricles of the heart; likewise the lymphatic and the nervous networks. Hardly two vessels are of equal length, size, shape and dimension in two different parts of the body. Therefore any comparison is necessarily to be more or less of guess-work. In the following table only the large and distinctive longitudinal vessels have been counted from the '*Atlas of Applied Topographical Anatomy*' of Karl von Bardeleben and Heinrich Haeckel and the '*Regional Anatomy*' of George Mc Clellan. It seems that Suśruta includes the nervous net-work in the vascular system which he divides into four classes, nervous (*Vāta*—air), venous (*pitta*-bile), lymphatic (*kapha*-phlegm) and arterial (*raktavaha-sira*-blood-carrying vessel). The identification of the

'*vāta*, *pitta*, *kapha* and *raktavahā sīras*' with the nervous, venous, lymphatic and arterial systems is not far-fetched and fanciful. For Suśruta says :—"The '*vāta*'-carrying vessels are of tawny or light-golden-brown (*aruṇa*) colour, and are filled with air; '*pitta*'-carrying vessels are all warm and of blue (*nīla*) colour; '*kapha*' bearing vessels are cool and of white (*śveta*) colour; the blood-carrying vessels are of red (*lohita*) colour and are neither warm nor cold." III. 7. 13^a.

"There are seven hundred tubular vessels : as gardens by water-conduits and fields by canals are irrigated and nourished, so by the irrigating and draining action of the '*sīras*,' the body is nourished and sustained. As the midrib of a plant-leaf gives off laterally countless veins, so from the main (*sīras*) small and smaller branches spread out." *Suśruta* III. 7. 2^o.

8a. तन्वाक्वा वातवहः पूर्यन्ते वायुना शिराः ।

पित्तादुष्वास नीलाश् शीता गौर्यः स्त्रिराः कफात् ।

असृग्बह्वस्तु रोहिष्यः शिरा नाल्यश्शीतलाः ॥ १२

५. सप्त शिरास्तानि भवन्ति ; यामिरिदं शरीरमाराम इव जलहारिण्यैभिः शिष्टार इव च कुल्याभिरुपलब्धतेऽनुगृह्यते चाकुञ्चनप्रसारवादिभिर्विधिभिः । द्रुमपत्रसिक्ता-
नामिव च तासां प्रतानाः । तासां नाभिर्मूलं, ततश्च प्रसरन्त्यूर्ध्वमधस्तिर्यक् च ॥ २

| Sûrta | Nerve-trunks | Veins | Arteries | Lymph vessels | Lymph. |
|---|--------------|-------|----------|---------------|--|
| I. The Four Branches | | | | | |
| Foot (Lower extremity) | 25 30 | 22 | 19 | 16 | |
| Arm (Upper extremity) | 25 26 | 33 | 21 | 23 | |
| II. The Trunk | | | | | |
| Pelvic region | 8 7 | 8 | 10 | 12 | 19 |
| Sides | 2p 9p | 9p | 9p | 9p | * (p = pair) |
| Back-bone | 6 17 | | | | |
| Breast | 10 15 | 7 | 10 | 10 | 12 |
| Stomach | 6 9 | 6 | 7 | 6 | 11 |
| III. Neck and Head. | | | | | |
| Neck | 14 15 | 14 | 15 | 16 | 10 |
| Ear | 2p 2 | 1 | 1 | | |
| Nose | 6 7 | 6 | 5 | 3 | Nerves : ramus vestibularis and auditory artery dividing into 3 branches ; internal auditory vein. |
| Tongue | 9 5 | 4 | 5 | 4 | |
| Eye | 4p 4 | 5 | 5 | | |
| Nerves : frontal, oculo-motor, optic, trochlear ; Veins : vena vorticosa, retinal, conjunctival, choroid and ciliary ; arteries : arteria centralis retinae, suprascleral, ciliary, choroid & conjunctival. | | | | | |

“The nervous (*pāta*), the venous (*pitta*), lymphatic (*kapha*) vessels are 175 each as well as the arterial (blood-carrying *śiras*) passing the liver and the spleen. Thus seven hundred ‘*śiras*’ spread out all over the body. In one foot, there are 25 nerve-vessels; likewise in the other foot and each of the arms. There are 34 nerve-vessels in the trunk of the body: in the pelvic region 8, in the sides 2 each, in the back 6, and in the breast 10, above the shoulder, there are 45: in the neck 14, in the two ears 4, in the tongue 9 and both the eyes 8. Thus 175 nerve-vessels are described. And this description also corresponds to that of the venous, lymphatic and the arterial (blood-carrying) vessels, with this exception that instead of 8 nerve-vessels in the eyes and 4 in the ears, there are 10 (in the eyes) and 2 (in the ears) of the venous, lymphatic and blood-carrying (arterial) vessels.” *Suśruta* III. 5. 7. 5-7¹⁰.

10. तासां मूलशिराश्चत्वारिंशत्—तासां वातवाहिन्यो दश, पित्तवाहिन्यो दश, कफवाहिन्यो दश, दश रक्तवाहिन्यः । तासान् वातवाहिनीनां वातस्थानगतानां पञ्चसप्तति-
शतं भवात्, तावत् एव पित्तवाहिन्यः पित्तस्थाने, कफवाहिन्यश्च कफस्थाने, रक्त-
वाहिन्यश्च यज्ञतृतीयाः—एवमेतानि सप्त शिराशतानि ॥५॥

तत्र वातवाहिन्यः शिरा एकस्मिन् सक्थि पञ्चविंशतिः । एतेनेतरसक्थिबाहू
च व्याख्यातौ । विश्वतस्तु कोष्ठे चतुर्विंशत् ;—तासां गुदनिर्द्वाश्रिताः श्रोत्रामटी,

That the heart was the centre of the circulatory system, of the blood, was well understood by *Suśruta* (1. 14. 3-6) and according to Charaka it has 10 out-going (*arterial*) and in-coming (*venous*) trunk-vessels (1. 30. 1).

“Though chyle [*rasa*] circulates all throughout the body, its principal centre is the heart (*hrdaya*). That chyle in 24 tubular vessels, 10 upwards, 10 downwards and 4 sideways, enters into every part of the body, irrigates and maintains its growth, vitalizes and supports life..... . Though chyle is aquatic in nature but in its passage through the liver and the spleen, it becomes blood. *Suśruta* 1. 14. 3-5.¹¹

इ इ पात्रयोः, षट् पृष्ठे, तावत् एव चोदरे, दश वक्षसि । एकचत्वारिंशन्नुष ऊर्ध्वे ;—तासां चतुर्दश यौवःयां, कर्णयोर्यतसः, नव जिह्वायां, षट् नासिकायाम्, अष्टौ नेत्रयोः । एवमेतत् पञ्चसप्तत्यधिकशतं वातवह्णानां शिराणां व्याख्यातम् ॥६॥

एष एव विभागः शिषाणामपि । विशेषतस्तु पित्तवाहिन्यो नेत्रयोर्दश, कर्णयोर्दश । एवमेतानि सप्त शिराशतानि सविभागानि व्याख्यातानि ॥७॥

11. तस्य हृदयं स्थानं, स हृदयाश्चतुर्विंशतिं धमनीरनुप्रविश्योर्ध्वा दश दश चाधो-गामिन्व्यसतस्त्रिर्यगः कृत्वां शरीरमहरहस्तपयति वर्धयति धारयति व्यापयति जीवयति चादृष्टहेतुकेन कर्मणा ॥३॥

तस्य शरीरमनुधावतोऽनुमानाद्गतिरुपलक्षयितव्या अथहृद्वैकृतैः । तस्मिन् सर्व-शरीरावयवदोषधातुमलाशयानुसारिणि रसे जिज्ञासा, किमयं सौम्यकौजस इति । अवोचते स खलु द्रवानुसारी केहनजीवनतर्पणधारणादिभिर्दिशेभैः सौर-हृत्पथगम्यते ॥४॥

“In the heart there are ten great out-going [*mahāmūlā*] and in-coming [*mahāphalā*] tubular vesseles [*dhamanī*].” Charaka 1. 30. 1^{1a}. The ten great vessels are the seven main trunk veins and three arteries as follows: (1) superior vena cava, [2] interior vena cava, [3] coronary sinus, [4-7] vena pulmonalis; [8] left pulmonary artery, [9] aorta, [10] right pulmonary artery.

“Below the heart, on the left side the liver and the lung, and on the right side, the spleen and the lung, are situated.” *Suśruta* III. 4. 30¹².

According to Chāraka the skin consists of six strata (IV. 7. 2)¹³ but *Suśruta* more accurately describes them to be seven. III. 4. 3¹⁴.

11a. अथै दश सङ्गमूलाः सिराः सक्ता महाफलाः ।

महश्चायंश्च हृदयं पर्यायैरुच्यते बुधैः ॥

12. शोणितकफप्रसादजं हृदयं, यदाश्रया हि धमन्यः प्राणवहाः । तस्याधो वामतः ग्रीवा फुस्फुसय, दक्षिणतो यज्ञत् क्षीम च ॥३०॥

13. सर्वं शरीरमभिसंचक्षाणाद् यथाप्रशमेकमनाः । यथावच्छरीरे षट् त्वचस्तद-
यथा—उदकधरा त्वग् बाह्या, द्वितीया त्वयस्त्वधरा, तृतीया सिन्धुकिलाससम्भवा-
धिष्ठाना, चतुर्थी कुष्ठसम्भवाधिष्ठाना, पञ्चमी अलजीविद्रव्यसम्भवाधिष्ठाना, षष्ठी तु
सा यस्यां क्षिप्रायां ताम्रतन्त्र इव च तमः प्रविशति यां चाप्यधिष्ठायान् विजायते
पर्वसन्धिषु कण्ठरक्तानि व्यूलमूलानि दुश्चिकित्स्यतमानि चेति, षट् त्वच एताः
षडङ्गं शरीरमवतस्य तिष्ठन्ति ।

14. तस्य खल्वे वंप्रपञ्चस्य शुक्रशोणितस्याभिपच्यमानस्य चौरस्यैव सन्नागिकाः सप्त
त्वचो भवन्ति । तासां प्रथमावभासिनी नाम, या सर्वं वर्णानवभासयति पञ्च-
विधाश्च ष्ठायां प्रकाशयति; सा ग्रीवरटादशभागप्रमाणा, सिन्धुपद्मकण्टकाधिष्ठाना
द्वितीया खोदिता नाम, षोडशभागप्रमाणा तिलकालकन्यच्छब्दकाधिष्ठाना । तृतीया

Suśruta

Strata of the skin according to
Modern anatomy

| | | | |
|------------|-----------|----------------------|--------------------|
| Avbhāsinī | Epidermis | Stratum corneum | Stratum lucidum |
| Lobitā | | Stratum intermedium | |
| Śvetā | | Stratum disjunctum | |
| Tāmrā | | Stratum granulosum | |
| Vedinī | | Stratum mucosum | |
| Rohiṇī | | Stratum germinativum | Corium |
| Māṃsadharā | | Corium | |

From the foregoing comparative charts, it will be seen, that though the ancient Hindu anatomical school erred in some details, but in fundamentals, their knowledge was remarkably accurate, minute and thorough, especially when we take into consideration the dim and distant age, in which these medical treatises were composed. The study of anatomy was regarded essential in the medical education and practice. Charaka says : —“In the medical science, knowledge of anatomy is necessary ; one can only understand principles of hygiene, when he has

चेता नाम, वादशभागप्रमाणा चर्मदलाजगद्गीमशकाधिष्ठाना । चतुर्थी तावा
नामाष्टभागप्रमाणा विविधकिलासकुटाधिष्ठाना । पञ्चमी वेदिनी नाम, ब्रीहपञ्च-
भागप्रमाणा कुष्ठविसर्पाधिष्ठाना । षष्ठी रोहिणी नाम, ब्रीहप्रमाणा गन्धपञ्चद-
शीपदगजगच्छाधिष्ठाना । सप्तमी मांसधरा नाम, ब्रीहिस्रयप्रमाणा भगन्दरविद्रव्य-
शीर्षाधिष्ठाना । यदेतत् प्रमाणं निर्दिष्टं तन्मांससंश्लेषकामिषु ; न ललाटे सूक्ष्मा-
ङ्गुल्यादिषु । यतो वक्ष्यत्युदरेषु ब्रीहिसुखेणाङ्गुष्ठोदरप्रमाणमवगाढं विध्येदिति ॥१

studied bodily sciences (anatomy and physiology) IV. 6. 1¹⁵.

Suśruta recommends dissection. He says :
 “The parts and the parcels (of the body) that have been mentioned up to the skin, can not at all be described without dissection. So if a surgeon wants to aquire positive (doubtless) knowledge, he should analyse thoroughly all the parts and organs of a body, after disinfecting it. Occular observation easily supplements studies and adds to knowledge. (The way a corpse should be taken for observation is described thus). The corpse should possess all the organs and not be deceased of any long illness or of poisoning, nor should it be of a man of a hundred years of age. The contents of its viscera (urine and feces) should be removed and it should be kept in a stream without current to rot. A platform should be made in the water to lay the corpse on it and cover the whole body with hay, grasses and leaves, so that fish can not eat it, and it is not put out of its place. In seven days, it will decompose sufficiently and then rub it gently from the skin to the interior with

15. शरीरविचयः शरीरोपकारार्थमिष्यते भिषग्विद्यायाम् । आत्मा हि शरीरतत्त्वं
 शरीरोपकारकरेषु भावेषु ज्ञानमुत्पद्यते तस्मात् शरीरविचयं प्रशंसन्ति कुशलाः ।

grass, hair or bamboo-skin and observe minutely every organ and every part of the body. *Susruta*, III. 5. 49-50¹⁶.

In the Hippocratic collection of writings, though there is no systematic presentation of muscles, ligaments, blood-vessels and glands, yet their knowledge and position are clearly indicated in the books '*peri arthron*' (articulations) '*peri osteon physios*' (the nature of bones), '*peri odenon*' (glands), '*peri sarkon*' (flesh) and '*mochaikos*'. However their description is very vague and meagre, as being mentioned indirectly in connection with the treatment for dislocation and fracture of bones.

Galen was undoubtedly, par excellence, the greatest of ancient anatomists. The manner

16. त्वक्पर्ष्यन्तस्य देहस्य योऽयमङ्गविनिश्चयः ।

शल्यज्ञानादहते नैव वर्ण्यं तेऽङ्गेषु केषुचित् ॥

तस्मान्निःसंशयं ज्ञानं हर्षां शल्यस्य वाञ्छता ।

शोधयित्वा स्रुतं सम्यग्द्रष्टव्योऽङ्गविनिश्चयः ॥

प्रत्यक्षतो हि यददृष्टं शास्त्रदृष्टञ्च यद्भवेत् ।

समासतस्तुभयं भूयो ज्ञानविवर्धनम् ॥४८

तस्मात् समस्तगात्रविषोपहतमदीर्घत्याभिधीकृतमवर्धयितुं निःसृष्टान्पुरीष-

पुरुषमवहन्त्यानापगायां निवृत्तं पञ्जरस्थं सुस्त्वक्कलकुशश्यादीनामन्यतमेनावेष्टिताङ्गम-

प्रकाशे देशे कोषयत् । सम्यक् प्रकुपितचोदृत्य ततो देहं सतरात्रादुशीरवाख्येषु

वत्कलङ्गुचीनामन्यतमेन शनैः शनैरववर्धयत्स्वगादेन सन्निवेद्य वाङ्माध्यन्तराङ्गप्रत्यङ्ग-

विशेषान् यद्योक्तान् लक्षयेत्तु वा ॥५०

and methods of his narration, the style of his language, the accuracy of his description, make the anatomical study, not only instructive, but captivating and refreshing. He divides his monumental work, "*The Utilities of the Human Body*" which became the classic and the standard authority in human anatomy in Europe and the Saracen empire for more than fourteen centuries, into 17 books or chapters as follows:—I. Hand ; II. Hand, fore-arm and the arm ; III. Abdomen ; IV. Alimentary organs and their auxiliaries ; V. Alimentary organs and their auxiliaries ; VI. Respiratory organs ; VII. Vocal organs ; VIII. The head, brain and the senses ; IX. The cranium, the brain and the cranial nerves ; X. The eyes and their auxiliaries ; XI. The face, especially the jaw-bones ; XII. The neck and the rest of the spine ; XIII. The pelvic structure ; XIV. Genital organs ; XV. Genital organs ; XVI. Nerves, arteries and veins ; XVII. Epilogue—Difference between function and utility. On every organ and every part of the body, Galen gives a comparative review of the similar structure of other animals and philosophic generalisations as to the origin and development of organs, which he ascribes to functional utility and

adaptation as a means of self-preservation and reproduction and thereby anticipating Lamarck (1744-1829) by nearly seventeen centuries. Below is given a short translation of his introductory general remarks on the 'genital organs', as a sample, believing that it will interest more readers than any other part of the body.

"Nature has three objects in view in the structural formation of the animal; she has created them really, either for preservation of life as the brain, heart and the liver, or for the convenience of life as the eyes, ears, nose and hands, or for the perpetuation of the race as the external genital parts as the testicles and the matrix; now we have previously demonstrated in detail, that any of the parts, either created for (preservation of) life, or for its embellishment, could not be better devised than what they are actually. It still remains for us to explain in this book, the parts, destined for the perpetuation of race among us.

"First of all, nature would have desired, if it were possible, to create her work immortal. Nature not permitting it, she has invented the expedient she could to obtain immortality for it (her creation), as a clever founder of a city, who not only cares that his city is actually

peopled, but takes all precautions that it lasts for ever, at least as long as possible. However it does not appear that any city has been fortunate on that point, to have lasted so long that time has completely effaced the memory of its founder. But works of nature have lasted for thousands of years and shall live still, by the admirable means, she has invented to substitute always a new animal for a dead animal.

“What is then the means adopted among animals and man, so that no race perishes, on the contrary each race remains intact and immortal ? That is what I propose to explain in this book, in commencing with my exposition. Nature has given to all animals organs of conception and she has associated with those organs a special impulse of pleasure of generation and filled the soul with such an irrestable desire, quite unexplainable with their functional uses, that the animals erotically excited and impassioned, especially the adolescent, though deprived of reason and understanding, attend to the perpetuation of the race, as if they were completely reasonable. One should think that nature really knowing that the objects she has created, being not susceptible of perfect wisdom, has given the

animals, as a substitute for that wisdom, the allurements of intense pleasure, associated with the usage of those organs to assure the salvation and conservation of the race.

“It is just to admire, first, the ingenious device of nature and then the structure of the organs which naturally correspond for each animal to its bodily form. You would learn from us one day, concerning other animals when we fill the gap, left by Aristotle. For the human species, all the world knows and understands, to what degree of utility, the external genitals by their convenient situation, their dimension, their figure and their entire conformation, have attained. When you will know the utility of each organ, profoundly hidden, organs which are revealed by dissection, you will admire, I am sure, the art that has created them.

“In fact, nature has placed the matrix beneath the stomach, the region she has recognized as the most favourable for copulation, reception of the sperm and especially for the growth of the embryo so that the fetus can attain to a perfect state. You could not find, in fact, in any part of the animal, another region more suitable, for any of the purposes above-mentioned; this is the best (place) for copulation, being far removed

from the facial organs ; most favourable for the growth of the fetus, being capable of considerable distension without difficulty and finally, the most convenient for the child-birth, as it is the easiest for the baby to slip off downwards to the inferior parts and the legs. In fact, the mouth of the matrix, which nature has formed as a passage for the entrance of the sperm and the departure of the embryo when it has reached its complete development, opens in the vagina. When the animal has conceived, the mouth(of the matrix)closes so firmly, it will not permit the least thing either to escape or to penetrate ; during copulation, it dilates and extends in such a way that the sperm has an easy and large passage to the matrix."

II. PHYSIOLOGY

‘*Anna*’ (food) supplies the body with ‘*dhātu*’ (elements) for its up-building and preservation.” *Suśruta* 1. 14. 11¹⁷. Food is converted in the alimentary tract into ‘*rasa*’ (chyle) by ‘*antaragni*’ (internal fire or combustion, that is oxidation). Oxidation takes place by the natural warmth of the ‘*pitta*’ (bile=sanguinary principle) of the body. “As fire in a hearth converts rice and water of a cooking pot into food and foam, so the digestive-fire (*pachatyagni*) converts the ingested food and drink into chyle and ‘*mala*’ (excreta=feces and urine).” *Charaka* VI. 15. 6¹⁸. The bile-duct being situated above the alimentary receptacle, digestion is facilitated by the favourable situation as that of the sun and the moon. (The idea being that as cooking easily takes place when the cooking-pot is placed upon the fire and not below it or sideways, so the stomach being situated above the bile-duct, which was regarded as the fire-principle, easy

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17. अन्नात् पानाच्च सतिमानाचाराश्चाप्यतन्द्रितः ।
तत्र रस गती चातुरङ्गरङ्गैश्चतुर्विधै रसः ॥११
18. एवं रसमवायात्रमाशयस्थमपःस्थितः ।
पचत्यग्निर्वा स्वास्थानीदमाशान्नु तन्मुक्तम् ॥

digestion was the natural consequence). Due to the rich aquatic content of the place, ingested food and drink are easily softened, favouring digestion. *Suśruta* 1. 21. 16.¹⁹

“Now the question is whether the (digestive) fire is a different thing from ‘*pitta*’ (the bile) or the bile is the fire? The answer is that due to its caloric quality, ‘*pitta*’ acts as fire in its action of cooking (*pachana*) and oxidation (*dahana*), and therefore, the bile is called the ‘internal fire’ (*oxidase*). *Suśruta* 1. 21. 9.²⁰

“The chyle (*rasa*) though aquatic, becomes red during its passage through the liver and the spleen. In the radiant heat of the body, the qualified chyle becomes red, and is called the ‘*rakta*’ (blood).” *Suśruta* 1. 14. 5-6.²¹

19. श्लेष्मस्थानान्यत ऊर्ध्वं वक्ष्यामः । तत्रामाशयः पित्ताशयस्योपरिष्ठात् तत्प्रत्यनीकरवाद्दृग्गतिर्यात् तेजसश्चन्द्र इवादित्यस्य ; स चतुर्विधस्याहारासाधारः । स च तद्वीर्यैर्गुणैराहारः प्रक्षिप्तो भिन्नसङ्घातः सुखजरो भवति ॥१६

20. तत्र जिज्ञास्य, किं पित्तव्यतिरेकादन्धोऽग्निः, आहोस्वित् पित्तमेवाग्निः इति । अत्रोच्यते,—न खलु पित्तव्यतिरेकादन्धोऽग्निरप्युपचरते, आप्रेयत्वात् पित्ते दहनपचनादिव्यभिर्बर्तमानेऽग्निवदुपचारः क्रियतेऽग्निरपिरिति । औषे अग्निगुणे तत्समानद्रव्योपयोगादतिप्रवृत्ते शीतक्रियोपयोगादागमाच्च पश्चान्नो न खलु पित्तव्यतिरेकादन्धोऽग्निरिति ॥६

21. स खल्वान्यो रसो यत्कृत्तुःशान्तिं प्राप्य रागस्तुपैति ॥५

भवतश्चात्र

रक्षितास्तेजसा र्वापः शरीरस्थेन देहिनाम् ।

अन्यापन्नाः प्रसङ्गे न रक्तमित्यभिधीयते ॥६

“Chyle is transformed into blood, blood into flesh, flesh into fat, fat into bone, bone into marrow and marrow into semen.” *Suśruta* 1. 14. 10.²²

“Because the chyle is transformed into ‘*dhātu*’ (elements or bodily substances), and it constantly circulates in the body, it is called the ‘*rasa*’.

“This ‘*rasa*’ remains in each ‘*dhātu*’ 3500 moments (that is, the chyle is formed the same day, but it takes five days for the chyle to be transformed into blood and blood into flesh etc.) and thus in one month it is converted into the semen of man and ‘*ārtava*’ (the rupture of the Graafian vesicles with the ripeness of the ova, or the menstrual blood which is associated with the occurrence) of woman.” *Suśruta* 1. 14.11-12²³.

Semen “circulates in every part of the body of all living beings ; as fat in the milk, sugar in the sugar-cane juice, so is the semen (*śukra*)

२२) रसाद्रक्तं ततो मांसं मांसान्मेदः प्रजायते ।

मेदसोऽस्थि ततो मज्जा मज्जः शुक्रस्य सम्भवः ॥१०॥

23. तत्र रस गती धातुरङ्गरङ्गच्छतीत्यतो रसः ॥११॥

स खलु वीथि वीथि कलासहस्राणि पञ्चदश च कला एकैकस्मिन् धाताववतिष्ठते ।

एवं मासेन रसः शुक्रोभवति स्त्रीणाञ्चार्चवमिति ॥१२॥

present in the human body." *Suśruta* III. 4. 20-21³⁴. It is not manifest in the children for it is present in a small quantity as the sweet aroma and delicate fragrance of a flower is not perceived in a young bud before time develops and ripens it, though its presence can not be doubted in an elementary state. *Suśruta* I. 14. 15^{34a}.

"In the living body, there are as many circulations as are present in the body like the chyle and the blood etc. for in the living body without circulation, they can not be produced or reduced." *Charaka* III. 5. 1³⁵.

"The centre of the vitalizing (*prāṇavaha*) circulation is the heart and the great trunks (*mahā-srota*) of arteries and veins). *Charaka* III. 5. 3³⁶.

24. सप्तमी युक्तधरा नाम, या सर्वप्राणिनां सर्वशरीरव्यापिनी ॥२०॥

भवन्ति चात्र

यथा पयसि सर्पिस्तु गुह्यस्थौ रसो यथा ।

शरीरेषु तथा युक्तं सृष्ट्यां विद्यादभिवर्गुरः ॥२१॥

24(a). यथा हि पुष्पसुकुलस्थो गन्धो न शक्नोति जातोति वस्तु नैव नास्तीत्यथवाति, सतां भावानामभिव्यक्तिरिति ज्ञात्वा केवलं सीमाग्राभिव्यज्यति स एव गन्धो विहतपत्रके शरीरे कुसुमे कालान्तरेण भिव्यक्तिं गच्छति ; एवं कालानामपि वयःपरिणामात् युक्तस्य प्रादुर्भावा भवति । रोमराज्यादयोऽप्यार्तवादयश्च विशेषा नारीणां रजसि चोपचीयमाने शनैः शनैः सप्तमर्गमययोऽभिव्यक्तिर्भवति ॥२५॥

25. यावन्तः पुरुषे मूर्तिभक्तो भावविशेषावावन्त एवास्मिन् जीतसां प्रकार-विशेषाः । सर्वे भावा हि पुरुषे नामनेष जीतास्त्वभिनिर्वर्तन्ते भाव्यधि-गच्छन्ति ।

26. तत्र प्राचवहानां जीतसां हृदयं मूलं महाजीतम् ।

“As the fibres of the water-lily and lotus stalks are naturally perforated, so in the tubular vessels, there are minute pores in the tubular vessels (*dhamanī*) through which the ‘*rasa*’ circulates.” *Suśruta* IV. 9. 9;.

I. Digestion.

From the above quotations, it can be seen that the ancient Hindu school of medicine grasped the essential fundamentals of digestion and circulation, though the intricate and complex process of their mechanism was not and could not be understood by them. Physiological chemistry is of but very recent development and growth. A few years ago, it was not even suspected that the digestion and absorption were due to the fermentative action of the glandular secretions. The digestive ferments or enzymes reduce the ingested food particles by cleavage into their elemental compounds by creating molecular instability through their electro-chemical action and in proportion as the food-stuffs are altered thus in the alimentary canal and transformed from insoluble into soluble substances, from such as are not diffusible into such

27. यथा स्वभावतः खानि वृषाक्षिपु विसेषु च ।

धमनीनां तथा खानि रसो यं कण्ठोद्यते ॥८

as are easily diffused, and they are absorbed by the epithelium of the gastro-intestinal mucous membrane and are synthetized into chyle during the passage through the restitutive secretion of the cells. The reaction of the enzymic activity upon the ingested food-particles, is the reduction and cleavage into their component elements, which is the same thing as oxidation. The Hindus understood that digestion was concomitant with oxidation (*antaragni*), but did not know that the oxidation was caused by the digestive ferments.

'*Rasa*' has been translated as the chyle, for it is the most appropriate available term. But '*rasa*' is more than chyle. '*Rasa*' is the whole of the soluble and diffusible solution of the digested food which being partially regenerated and synthetized during its passage through the mucous membrane by the anabolic restitutive secretions of the living cells, either enters into the lymph sinuses of the mucosa, or are absorbed by the solitary and agminated follicles and by the lymph-glands interposed along the lacteals or are taken up by the blood capillaries of the mucous coat, especially in the villi of the small intestine. Whether the '*rasa*' forced into the lymph torrent is carried along the thoracic duct

which pours its contents (lymph and chyle) into the left subclavian vein or absorbed in the blood capillaries of the villi, travel by the venous portal system, it has to pass through the hepatic cells for further synthetic transformation, before it is driven to the heart for general circulation.

The blood is red in color, for it is caused by the mass of red-corpuscles (*erythrocytes*) held in suspension in the plasma. The blood is composed of a liquid part, the 'plasma', in which float a vast number of microscopical bodies, the red corpuscles (*erythrocytes*), the white corpuscles (*leucocytes*) and the blood plates or platelets (*hematoblast*). The red corpuscle has the shape of a biconcave disk with bevelled edges with a diameter of 0.0075 millimeter in man and for each cubic millimeter of blood, there are red corpuscles in man from 4 to 5 millions, in goat 9 to 10 millions, in sheep 13 to 14 millions, in birds 1 to 4 millions and in fish quarter million to two millions. The chief function of the red corpuscle is to carry oxygen, which it owes to its principal ingredient—haemoglobin and which possesses the special quality of chemically combining with oxygen and yielding up the same oxygen, whenever there is decrease in the concentration of oxygen in the solvent. In perfor-

mance of this important function, the red corpuscles soon lose their vitality, deteriorate and are disintegrated in the liver. The liver eliminates the wastes and the pigments as an excretory product, which thus receives the golden brownish tinge. The bile is essentially the excretory product of the metabolic wastes which are formed in the hepatic cells as a result of their detoxicating and metabolic activities, but the bile has adapted in the economy of the system, to the functional utility of zymo-exciter, particularly of the lipolytic enzymes. The red corpuscles are newly formed again in the red bone marrow and the spleen, where special cells are provided for their reproduction. But it is probable that the spleen plays a more important role in the integration and synthesis of the haemoglobin molecules, for iron is its important component element, having special chemical affinity for oxygen, and iron is principally metabolized in the spleen.

It is therefore a delightful surprise to read in Charaka and Suśruta that they attributed to the liver and the spleen of transforming '*rasa*' into blood, and heart was the centre and medium of the blood circulation to irrigate, feed, nourish and sustain tissues and life. Of course it was a fanciful speculation that the blood is trans-

formed in five days into flesh and in a month into semen. But the blood supplies the nutrient materials for the cellular sustenance, growth and upbuilding. And it is a fact, though 'spermin', the special substance of the semen, is found in concentrated form in the testes and prostate, it is found in a considerable quantity in the thymus, milt, ovaries and the blood and plays an important role in the general oxidation of the tissues and in the metabolic reduction of the intermediate regressive albuminous substances as leucomines into harmless products as urea. *

'Rasa' contributes to health, pleasant countenance and nourishes the blood ; the blood contributes to the brightness of the skin, nourishment of the flesh and keeps one alive ; fat contributes to the adipose tissues, perspiration, hardihood and health of the bone ; the bone keeps the bodily frame and nourishes the bone-marrow ; the bone-marrow contributes to the pleasant countenance, adipose tissues, strength (of the body), increase of the semen and fills the bone ; the semen contributes to the personal bravery, resistance to disease (*chyavana*),

* (A. Poehl : *Einwirkung des Spermins auf den Stoffumsatz*. *Zeit für klin. Med.* 1894, p. 135)

inclination to pleasure, physical strength and reproductive power. *Suśruta* I. 15. 6¹.

“*Sleşma*’ (lymph) is produced in the intestine, sweet and cool; from the sweetness, viscosity, and humidity from the digested food.” *Suśruta* I. 21. 17².

“*Sleşma*’ is white (chyle in the lacteal, especially after the heavy ingestion of fat), heavy and cool; when it is unoxidized (*avidagdhā* in the lacteal and in the thoracic duct, still in the condition of chyle), it is sweet, but when oxidized, it is alkaline.” *Suśruta* I. 21. 19³.

Sleşma “lubricates joints (*snovia*), is fattening, healing, flesh-giving, causes growth, refreshing through moistening, strengthening, adds to the thickness of the subcutaneous fat, and thus ‘*sleşma*’ doing five functions according to the position, benefits the body.” *Suśruta* I. 15. 5⁴.

28. रक्तपुष्टिं प्रीचनं रक्तपुष्टिञ्च करोति । रक्तं बभ्रुप्रसादं मांसपुष्टिं जीवयति च । मांसं शरीरपुष्टिं मेदयत्येव । मेदः कोष्ठस्तेदी हृदयं पुष्टिमव्याह । पक्षि दीहधारणं मत्तः पुष्टिञ्च । मत्ता प्रीतिं कोष्ठं बलं यत्तपुष्टिं पूरणमव्याह करोति । यत्तं शैव्यं चयनं प्रीतिं दीहवत् हर्षनीजार्थञ्च ॥६॥

29. मापुर्व्यात् पिच्छित्वाच्च प्रक्षेपित्वात् तथैव च ।

आमाशये सञ्चयति श्लेष्मा मधुरशीतलः ॥१७॥

30. श्लेष्मा चेतो मुखः शिरः पिच्छितः शीत एव च ।

वपुर्गुणविदग्धः स्नादिदग्धो जवयः क्षतः ॥१८॥

31. श्लेष्मिन् श्लेष्मसंश्लेष्मरोपचपूरचङ् हृत्तपं चयनस्यैव यत्तं श्लेष्मा पचया प्रविभक्तं च दधत्तं चानुपचङ् करोति ॥१९॥

That by '*śleṣma*' or '*kapha*,' lymph was understood, is proven by the fact that Suśruta describes in the vascular system (III. 7. 1-13) the tubular lymph-vessels with arteries, veins and nerves and that his '*śleṣma*' corresponds to the synovial lymph, is corroborated by this passage :—"As it works well, if oil or fat is applied to the axle of a carriage wheel, so the '*śleṣma*' acts in the joints of the living beings." III. 4. 15².

II. Circulation

The lymph is a colorless liquid found in the lymph vessels as well as the extravascular parts of the body, having almost the same constituents as the blood-plasma. The lymph is at least in part the mediator in the exchange of constituents between the blood and the tissues. Throughout the entire body, there is a rich supply of blood vessels penetrating every tissue with the exception of the epidermis and epidermal structures as the nails and hair. In the ground-work of the tissue, there is space and this interstitial space is filled with lymph and thus all the tissue elements, in fact, may be regarded as being bathed

in lymph. From this fluid the cell takes the necessary nutrients dissolved in it, and into it the cell discharges its waste products. In the interstitial space, the lymph freely intercommunicates, finally connecting with a number of fine tubes—the lymphatics, through which excess of fluid, tissue wastes, pathogenic germs and their products are drained off. The lymphatics like the blood-vessels freely anastomose, thus forming large trunks which finally empty their contents in the main venous trunks at both the junctions of the jugular and subclavian veins. In the course of the lymphatics, there are numerous adenoid structures (lymph-glands) which act as a filter as the fluid passes through them, retaining all the pathogenic germs, their deleterious products as well as various excretory products, which the lymph-glands either destroy or make them comparatively harmless.

The flow of the blood-plasma into interstitial space, where it is known as the lymph, is governed by the principles of pressure, filtration, diffusion, osmosis and the relative permeability of the capillary walls. The intracapillary pressure tends to filter the plasma through the endothelial cells composing the walls of the capillaries ; the force of diffusion arises from

the inequality of the chemical composition of the blood-plasma and the interstitial fluid ; osmosis from different molecular concentration and relative permeability according to the regional capillary structure.

Though lymph lacks any central heart system as the blood vessels, the flow of its circulation is perhaps regulated by the relative pressure-level from the higher tension in the capillaries to lower in the lymphatic space and in the minute vessels considerably much greater than in the larger ones as in the veins, and as this difference of pressure is the cause of the flow of venous blood from the capillaries to the heart. This flow may be accelerated by other factors. The lymphatics are provided with muscular wall of automatically oscillating tanus under the influence of special vascular nerves and as with each systolic efflux, there is an increased pressure of the arterial flow, muscular and nervous dilation which make the perivascular lymphatic valves act like tiny pumps, accentuating the momentum of the centripetal evacuation of the contents. Perhaps inspiration also exerts a sucking action by positively lowering the pressure at the sub-clavian vein in which the thoracic duct empties its contents.

The lymph fluid is not uniform in composition in every part of the body. The lymph originates from three sources : (a) by filtering from the blood through the capillary wall ; (b) from exudation of the tissues with their anabolic and catabolic wastes ; (c) the digested nutrient solution which is absorbed by the lymphatic roots of the intestinal villi and which is known as the chyle.

The composition of the lymph, therefore, is variable. In the lacteals, the lymph mixed with the chyle has often after the ingestion of heavy fat and protein, a milky white appearance and contains a good deal of sugar. The lymph which flows from the fistula of the thoracic duct, is a watery, slightly opalescent fluid. In the capillary lymph-space and in the large serous cavities as the peritoneum, pleura, pericardium, tunica vaginalis of testicles, where there is always a sufficient quantity of the lymph to keep the walls lubricated and moistened, it is a colorless liquid, almost like water, but decidedly alkaline.

The lymph does not coagulate as easily as the blood. But it contains fibrinogen and in case there is any rupture of the lymphatic, it readily clots so that no serious damage be done

to the tissues. But unlike the blood, the lymph contains a very few corpuscles. Platelets and functions (*thrombocytes*) are always absent; the red-corpuscles (*erythrocytes*) are met with on very rare occasions; but the *leucocytes*—the wandering cells, are always found, though smaller in size and fewer in number. Perhaps the leucocyte through its ameboid movement traverses through the capillary membrane and enters into the lymph-stream and acts as useful scavenger and devourer of any pathogenic germ that might have gained access in the tissues; or the leucocyte may be produced in the lymphatic glands and enter into the arterial circulation when the lymph trunks empty their contents at the junctions of the jugular and subclavian veins and are carried to the heart. In the blood the leucocytes are seen larger and with developed phagocytic power for the reason that the blood contains opsonin and alexin which sensitize the pathogenic micro-organisms, thus facilitating phagocytosis. The destroyed germs are dissolved in the blood, increasing thus the protein content, which is a nourishing food to the leucocytes.

So lymph glands not only filter and purify the lymph stream, they are ever watchful sentinels to catch and retain any dangerous marauder

that may be in the lymph torrent, but also are active synthetic laboratories for the origin and development of the leucocytes. In this vital work with the lymph-glands in the lymphatics, all the lymphoid adenoid bodies as the spleen, bone-marrow and the thymus have their important share. In malarial fever, it is a well known fact that the spleen is enlarged. This only means that the spleen is hyperactive, destroying the minute protozoa that are attacking the red-blood corpuscles and producing an excessive number of leucocytes for the bodily defence. This also explains that with the ablation or total extirpation of the spleen, there is no serious consequence or there is any marked reduction of the leucocytes in the blood. The task of the spleen is supplemented and functioned by the bone-marrow and the numerous lymph-glands which are numerous and are scattered either single or in cluster all throughout the lymphatics.

On the whole the flow of the lymph is very sluggish and much slower not only than the arterial, but also than the venous blood.

Susruta also mentions twenty-four '*dhamani*' and passage of some other liquids in the body. But he does not confound '*dhamani*'

with '*sira*' (vascular system) like Charaka (I. 30. 10). He says : "There are some who say that *dhamanī* and *srota* are not different from the *sira* (vascular system). But this is not just; *dhamanī* and *srota* are different from the '*sira*'. For the characteristics of the '*srota*' and '*dhamanī*', differ from those of '*sira*.' How ? For the '*siras*' have main central trunks and their action is also otherwise. In the medical science, they are mentioned separately. Only because they are situated close to each other, they are minute and there is some similarity in their action, therefore in spite of their dissimilar activities, they are often confounded with each other. *Sūsruta* III. 9. 2³.

"There are two vital streams—*srota* : their main bearers (*mūlasthāna*) are the heart and chyle-carrying tubes (lacteals and thoracic duct); if they are penetrated (by any wound), involuntary cries, syncope, hallucination, illusion and trembling appear and death might even take

33. चतुर्विंशतिर्धन्यो नाभिप्रभवा अभिहिताः । तत् कैचिदाहुः शिराधमनी-
क्षीतसामविभागः, शिराविकारा एव धमन्यः क्षीतांसि चेति । तत् न सत्यम् ।
अथवा एव हि धमन्यः क्षीतांसि च शिराभ्यः । कस्यात् ? व्यञ्जनान्यतान्मूलसन्नियमात्
कर्णवैशिष्ट्यादागमाच्च । केवलम् परस्परसन्निकर्षात् सदृशागमकर्णत्वात् सीम्नाच्च
विभक्तकर्णस्थानप्यविभाग इव कर्णसु भवति ॥२

place. Alimentary canals are two and their bearers are the intestine and the lacteals : if they are penetrated, pain, loss of appetite, vomiting, thirst, blindness or immediate death take place. Serous (*udaka*) tubes are two and their bearers are 'tālu' (between the meningeal membranes surrounding the central nervous system) and the 'kloma' (*pleura*) ; if they are penetrated, thirst and immediate death take place. Chyle-carrying tubes are two and their main bearers are the heart and the chyle-carrying vessels (the lacteals and the thoracic duct) ; if they are penetrated, there is edema or immediate death with symptoms the same as if the heart and the main arteries are wounded. The blood-vessels are two (the hepatic artery and the portal vein) and their main bearers are the liver and the spleen, and the blood-vessels ; if the sources of the two vessels (the liver and the spleen) are penetrated, there are paleness of the skin or jaundice, fever, burning sensation, bleeding and redness of the nose. Streams of circulating protein (*māṃsavaha*) are two and their main sources are ligaments, skin and the blood-vessels ; if their main sources are penetrated, edema, emaciation, vascular obstruction and even death might take place. The urine-bearing tubes are

two, the bladder and the penis ; if their main sources are penetrated, there are suppression of the urine in the bladder, anuria and paralysis (insensibility) of the penis. The feces-carrying tubes are two ; their sources are the intestine and the anus ; if they are penetrated, there are constipation, offensive odor, and the tying down of the entrails (*antra*—the bowel). The seminal tubes are two : their sources are the mamma and the testicles ; if they are penetrated impotence, difficulty in seminal discharge take place. The ovarian (*ārttava-vaha*) tubes are two : their sources are the matrix and the ova-carrying tubes (the *ovi-ducts*—Fallopian tubes) ; if they are penetrated, sterility, pain in copulation and amenorrhea take place." *Suśruta* III. 9. 12³⁴.

34. तानि तु प्राणान्नीदकरसरक्तमांसमिदोमूत्रपुरीषशकार्त्तववह्निनि. येनधिकार
एकेषां वह्निः । एतेषां विशेषा वद्वः । तत्र प्राणवह्ने ह, तयोर्मूलं हृदयं रस-
वाहिन्यस्य धमन्यः ; तत्र विद्वस्य शीघ्रमविलसन्मोहमधन्यविषमनि मरणं वा भवति ।
अन्नवह्ने ह, तयोर्मूलमाशयोऽन्नवाहिन्यस्य धमन्यः ; तत्र विद्वस्याभ्मानं यत्नान्नहो
वह्निः पिपासान्त्रं मरणं वा । उदक्वह्ने ह, तयोर्मूलं तालु क्रीम च ; तत्र
विद्वस्य पिपासा सद्यो मरणम् । रसवह्ने ह, तयोर्मूलं हृदयं रसवाहिन्यस्य
धमन्यः ; तत्र विद्वस्य शोषः प्राणवह्निविवक्ष मरणं तस्मिन्निनि च । रक्तवह्ने ह,
तयोर्मूलं यक्ष्मप्रीकानी रक्तवाहिन्यस्य धमन्यः ; तत्र विद्वस्य श्वाबाह्ना ज्वरो दाहः
पाण्डुता शोषितातिगमनं रक्तनेत्रता चेति । मांसवह्ने ह, तयोर्मूलं कायुलव
रक्तवह्नास्य धमन्यः ; तत्र विद्वस्य ज्वरयुर्मांसशोषः शिराघण्ययोर्मरणं वा । मिदो-

Here of course Suśruta has used '*śrota*' in the generic sense of what are described in modern anatomy as tubes, ducts, canals and cavities.

III.—The Nervous System

"The normal '*vāyu*' (nervous system) is the regulātor of the physical mechanism. The nerves are of five kinds, '*Prāṇa, apāna, samāna, udāna* and '*vyāna*.' It carries out the physical attempts (muscular contractions), reveals the senses and is the carrier of the sense-perceptions as the impression, taste, smell, touch and hearing. It is the strengthener of the bodily elements (*dhātu*) and the co-ordinator of the bodily organs. It activates speech, bases of sound and hearing and is the main cause of the consciousness

वहै हे, तयोर्मुखं कटीवल्ली च ; तत्र विहस्य स्वेदागमनं शिग्धाकृता तानुशोषः
 क्लेशशोफता पिपासा च । सूत्रवहै हे, तयोर्मुखं वक्षिर्मेढ्रश्च ; तत्र विहस्यान्न-
 वक्षिता सूत्रनिरोधः क्षब्धमेढ्रता च । पुरीषवहै हे, तयोर्मुखं पक्वाशयो गुदश्च ;
 तत्र विहस्यान्नो दुर्गन्धता यथितान्नता च । शुक्रवहै हे, तयोर्मुखं सानी वृषवी
 च ; तत्र विहस्य क्लीवता पिरात् प्रसेको रक्तशुक्रता च । आर्तववहै हे, तयो-
 र्मुखं गर्भाशय आर्तववाहिन्यश्च धमन्यः । तत्र विहसां बन्ध्यालं भैद्युनासद्विच्युल-
 मार्तवनाशश्च । सेवनीच्छेदाद्रुजाप्रादुर्भावः । वक्षिगुदविहस्यश्च प्रागुक्तमिति । स्त्रीतो-
 विहस्य प्रत्याख्यायोपचरेदुद्युतश्च सन्निविधानेनोपाचरेत् ॥१२

of sound and touch. It is the source of pleasure and cheerfulness. It increases the digestive fire and eliminates from the body all the waste-products." *Charaka* 1. 12. 7³⁵.

"The '*prāṇa*' nerves (*cerebrospinal*) are located in the brain, thorax, ears, tongue, face and nose. Spitting, sneezing, vomiting, respiration and digestion are the functions of the '*prāṇa-vāyā*'. '*Udāna*' nerves (cervical, thoracic and brachial plexus) are located in the umbilicus, thorax and in the neck; speaking, exertions, heat, strength and complexion are its activities. '*Samāna*' nerves (*vasodilator*) are located in the sudoriferous glands and ducts, and in the lymphatics (*amru*.) It being situated by the side of the digestive fire (bile-duct ?), it increases digestive fire. '*Vyāna*' (motor) nerves are spread over the entire body. Their conduction is very rapid. By '*vyāna*' nerves, walking, extension, movements of the hands and feet, contraction

35. वायुसामान्यनधरः, प्राणोदानसमानव्यानात्मा, प्रवर्तकश्चेदानीमुच्चारणार्ण,
निश्चयाना प्रवेत्ता च मनसः। सर्वेन्द्रियाणामुद्योतकः, सर्वेन्द्रियार्थानामभिबोद्धा,
सर्वशरीरधातुव्यूहकरः, सन्धानकरः शरीरस्य, प्रवर्तको वाचः, प्रकृतिः स्पर्शवन्द्योः
श्रोत्रस्पर्शमयोद्भूतम् उर्ध्वोत्साहयोर्योगिः। समीरणोऽग्नेर्दीपसंशोषकः; चेत्ता वहि-
र्भाषाणां; स्त्रोत्राद्युद्योतकां मेत्ता; कर्त्ता गर्भाकृतीनाम् आयुषोऽनुष्ठतिप्रत्ययभूतो
अवलङ्घ्यपितः ॥

(of muscles), the twinkling of the eyes and other activities are accomplished. *Apāna* (automatic or sympathetic) nerves are located in the testicles, bladder, reproductive organs, umbilicus (abdomen), knee, hip and the anus. The *apāna* nerves residing in the bowels, cause the elimination of semen, urine and feces and the expulsion of the ova and the fetus." *Charaka* VI. 28. 4-9³⁶.

"The brain is the centre of the senses." *Suśruta* III. 3. 18 ³⁷.

"The ten nerves (*dhamanī*) of the upper

36. स्थानं प्राणस्य शीर्षोरः कर्णजिह्वास्त्रिमासिकाः ।
 श्रोत्रनखबद्धद्वारश्चासङ्गारादि कर्म्म च ॥
 उदानस्य पुनः स्थानं नाभ्युरः कण्ठ एव च ॥
 वाक्प्रवृत्तिः प्रयत्नोर्जोबलवर्णादि कर्म्म च ॥
 स्नेहदोषान्नुवाङ्मोनि क्षीतांसि समधिष्ठितः ।
 अन्तरघ्नेय पार्श्वस्थः समानोऽग्निमलप्रदः ॥
 देहं व्याप्नोति सर्व्वेण स्यान् शीघ्रगतिर्नृणाम् ।
 गतिप्रसरणाच्चेपनिमिषादिक्रियः सदा ॥
 हृषणी वस्तिमेद्रश्च नाभ्यूर् बद्धश्चणी गुदम् ।
 अपागप्यानमन्वस्थः युक्तमूत्रयक्तक्रियः ।
 कृजत्यार्त्तवगर्भौ च युक्ताः स्थानस्थिताय ते ॥
 स्वकर्म्म कुर्व्वन्ते देहो धार्यन्ते तैरनामयः ।
 विनागस्थौ ह्ययुक्ता वा रोगैः स्वस्थानकर्म्मजैः ॥
 शरीरं पीडयन्तीति प्राणानाम् हरन्ति वा ॥

37. शिरोमूलत्वाद्देहिन्द्रियाणाम् ।

extremities, by activating sound, touch, impressions, taste, smell, respiration, sighing, yawning, hunger, laughing, speech, and crying, maintain the body. ...Two (auditory) carry sound; two (optic) carry impressions; two (lingual) carry taste and two (olfactory) carry smell. By two man speaks, by two makes (vocal) sound, by two he is asleep and by two he is awakened." *Suśruta* III. 9. 4³.

"Man sleeps when sense-organs cease to operate, being tired by the fatigue of the mind." *Charaka* 1. 21. 35³⁰.

"Memory is caused by the following eight causes :—From the cause of impressions, (their) similarities and dissimilarities, co-ordination of the mind, practice, consciousness, concentration (of attention), what is remembered from repeti-

33. ऊर्ध्वगः शब्दस्पर्शरूपरसगन्धप्रज्ञासौख्यमजृम्भितचक्षुःश्रुतकथितरुदित्वादीन् विशेषानभिवृत्तयः शरीरं धारयन्ति । तासु हृदयमभिप्रपन्नास्त्रिधा जायन्ते — तास्त्रिंशत् । तासान् वातपित्तकफशोणितरसान् द्वे द्वे वृत्तः—ता दश । शब्दरूप-रसगन्धानाभिर्गृह्णीते । द्वाभ्याञ्च भाषते, द्वाभ्यां शेषं करोति, द्वाभ्यां स्वपिति, द्वाभ्यां प्रतिबुध्यते । द्वे चायुवाङ्मनसौ । द्वे कर्म स्त्रिया यद्वत्तः कर्मसंज्ञिनौ ; ते एव शुक्लं गरलं कर्माभ्यामभिवृत्तः । तास्त्रिंशत् सविभागा व्याख्याताः । एताभिर्द्वे नभिरुदरपाचपृष्ठोरःस्त्वन्धीवावापुवो धारयन्ते याप्यन्ते च ॥४॥

39. यदातु मनसि ज्ञाने कर्माभ्यामभिवृत्तयः ।

विषयेभ्यो निवर्तन्ते तदा स्वपिति मानवः ॥

tion of sight, hearing or perception (as tasting or smelling), is called the memory." *Charaka* IV. 1. 117-118⁴⁰.

"The side-way four (cutaneous) nerves, branching into hundreds and thousands, they have become countless. They open in the hair follicles by which they carry the sweat (*sveda*) and sebaceous secretion (*rasa*). By these secretions the internal and external body is moistened and refreshed...By them the pleasure and pain of touch are felt." *Suśruta* III. 9. 8⁴¹.

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वक्षान्ते कारणावष्टौ क्षुतिर्यैरुपजायते ।
 निमित्तरूपयष्ट्यात् सादृश्यात् सविपर्ययात् ॥
 सत्त्वानुबन्धादभ्यासाज्ज्ञानयोगात् पुनः श्रुतात् ।
 दृष्टश्रुतानुभूतानां अरण्यात् स्मृतिरुच्यते ॥
 एतत्तदेकमयमं मुक्तौ मोक्षस्य दर्शितम् ।
 तत्त्वस्मृतिबलं येन गता न पुनरागताः ॥
 अयमं पुनराख्यातमेतद्योगस्य योगिभिः ।
 संख्यातधर्मैः सांख्यैश्च मुक्तौ मोक्षस्य चायमन् ॥

41. तिर्यग्गुणाण्यनु चतस्रणां धमनीगानिकैका शतधा सङ्ख्यधा चीतरीतरं विभज्यन्ते, तास्तुसङ्ख्याः । ताभिरिदं शरीरं गवाक्षितं विवक्षमाततश्च । तासां सुखानि रोमरूपप्रतिवद्धानि ; ये स्नेहमभिवृद्धिं रसश्चापि सन्तर्पयन्त्यन्यर्थाद्विच, तेरेव चाभ्यङ्गपरिचैकावगाह्यालिपनवीर्याख्यः शरीरमभिप्रतिपद्यते त्वचि विपक्वानि तेरेव अर्शसुखमसुखं वा गृह्णाति । तास्वेताश्चतस्रो धमन्यः सर्वाङ्गताः सविभागा व्याख्याताः ॥८

“The waste-products (*mala*) of digested aliment, are the feces and the urine....., of lymph mucous exudation, of blood, the bile, of flesh, as the wax in the ear-tube (sebaceous secretions), of fat the sweat, of bones the nails and hair, of bone-marrow wax in the eye-pits, and of the skin oil (sebaceous fatty secretion). *Suśruta* 1.46.550⁴².

Kapha (lymph), *pitta* (bile = oxidation) and *vāyu* (air = nerves) maintain the body as the moon, the sun and the air vitalize the earth by their activities of humidity (of the moon), heat (of the sun) and the conduction of heat and cold (by the air current). *Suśruta* 1.21. 8⁴³.

The above quotations tend to prove that the ancient Hindu schools of medicine believed that the body was nourished by the lymph and the blood formed out of the chyle during its passage within the liver and the spleen, was the medium of circulation and the nerves acted as the conductor of sense-perceptions of which the brain was the centre.

In the Hippocratic writings we find almost

42. कफः पित्तं मलः श्लेष्म खेदः स्यान्नखरोम च ।

नेत्रविट् त्वष्टु च खेदो धातूनां क्लमयो मलाः ॥५५०

43. निरुग्नादानविशेषैः खीनसूर्यानिता यथा ।

धारयन्ति जगद्देहं कफपित्तानिजासया ॥८

similar views, though with less clearness and positive assertions. In '*peri physios anthropoy*' 4-5(=the nature of man), there are four ground principles—the blood (*aima*), phlegm (*phlegma*), yellow bile (*cholen xanthen*) and black bile (*cholen melainan*), which are described to be mixed and to circulate in the body. In the '*peri noison to tetarton*'=the fourth book of the *Maladies* 33), only bile is mentioned without any qualification and for the other bile, water (*udrops*) is substituted. "The sources for the blood are the heart, for the phlegm the brain, for the water the spleen, for the bile a section of the liver." 33. They are introduced into the system with the ingested food and drink, containing these principles (*peri noison* IV. 35-38). Many glands (*peri adenon*=glands 1-10) as the tonsil, mamma, lymphatic ganglions in the neck, arm-pit and groin as well as the brain, have been mentioned but not the pancreas, testicles or ovaries. The function of the glands is to absorb the superfluous liquid in the body and thus to preserve the bodily equilibrium. The largest and the most important gland par excellence was supposed to be the brain and its function was to pump and distribute the liquid in all parts of the body according to the organic needs.

Galen distinguished between the arterics and the veins. According to him the blood was formed in the liver and it was sent to the heart for the distribution in all parts of the body after the volatilized '*pnēuma*' (air = the spirit = the soul) has been separated. The '*pneuma*' mixed with the air brought from the lungs, becomes the vital essence of life (animal spirit) and from the brain, circulates to all parts of the body with the nerves. Before Galen it was believed that the vital spirit (*pneuma* = air) circulated in the arteries, for arteries are always found empty after death.

According to Charaka (IV. 7. 8) there are eight handfuls (*añjali*) of blood and six of lymph in a normal healthy human body. (Because the body fluid constantly increases, or decreases, any calculation by the '*añjali*' measure can be but conjectural). There are ten handfuls of water, according to each individual's own measure—the water that after absorption, becomes mixed with feces, urine, blood and other materials of the body; which circulating in the system, nourishes the outer skin; which entering into the abscess under the skin, is known as '*lasikā*'; which being evaporated by the heat of the body, is eliminated as perspiration; that water (*udaka* = serous fluid)

is ten handfuls. The material that is first formed out of the digested food and which is known as the chyle, is nine handfuls. The blood is eight handful, feces seven, lymph six, bile five (or the venous blood), urine four, 'vasā' (serum of the flesh) three, fat two, bone-marrow one, brain (or brain-serum) half handful, semen half handful and 'ojās' (prostate gland secretion) half handful." *Charaka* IV. 7. 10⁴⁴.

According to Foster (*Physiology*, p. 49), "the total quantity of blood in the human body is about one thirteenth of the body weight." Howell (*Physiology*, p. 458) says : "The ratio of weight of blood to weight of body is in the dog 7. 7 per cent ; rabbit and cat 5 p. c. ; birds 10 p c. ; in man we have upon record two determinations on guillotined criminals made by Bischoff, which

44. यत् त्वञ्जलिसङ्केत्यं तदुपदेशानः, तत्परं प्रमाणमभिज्ञेयं तच्च द्वि-
 ज्ञासयोगि तर्कमिव । तद्यथा दशोदकस्याञ्जलयः शरीरे स्वेनाञ्जलिप्रमाणेन यत् तु
 ग्रन्थबलानं पुरीषमनुवध्नात्यतियोगेन तथा मृतं बधिरमन्वांश्च शरीरधातून्, यत् तु
 स्वर्गशरीरचरं वाञ्छलम् विभर्ति यत् त्वग्नरे ग्रन्थगतं लसीकांश्च लभते यज्ञो-
 ष्ठाणामनुवध्नीमन्नुपेभ्यो निष्पतत् स्वेदश्चन्दनवाप्नोति तदुदकं दशाञ्जलिप्रमाणम् ।
 नवाञ्जलयः पूर्वस्थाहारपरिणामधातोयद्रवमित्यावधते । अटी शोणितस्य, सप्त पुरी-
 षस्य, षट् श्लेष्मस्य, पञ्च पित्तस्य, चत्वारो मूत्रस्य, त्रयो वसायः द्वौ मेदस्य, एको
 मज्ज्ञः, मलिम्वस्य अर्धाञ्जलिः, शुक्रस्य तावदेव प्रमाणं, तावदेव देवशचीजस्य
 अन्वेतशरीरतत्त्वमुक्तम् ।

gave 7. 7 and 7. 2 per cent. Haldane and Smith however have devised a modification of Grèhant's carbon monoxide method, which they have applied to living men. The results of some 74 experiments gave them an average value of only 5 per cent per man. The distribution of this blood in the tissues of the body at any time has been estimated by Ranke from experiments on freshly killed rabbits, as follows : spleen, 0. 23 p. c. ; brain and cord, 1. 24 p. c.; kidneys, 1. 63 p. c.; skin, 2. 10 p. c.; intestines, 6. 30 p.c.; bones, 8. 24 p. c.; heart, lungs and great blood-vessels, 22. 76 p. c.; resting muscles, 29. 20 p. c. ; liver, 29. 30 p. c."

The blood circulates in the tubular closed vessels, for thereby the pressure is increased and the time for completing the circulation is reduced. "If we take 180 grams, as the quantity in man, ejected at each stroke at a pressure of 250 mm. of mercury, which is equivalent to 3. 21 meters of blood, this means that the left ventricle is capable at its systole of lifting 180 grams 3. 21 m. high, i. e. it does 578 gram-meters of work at each beat. Supposing the heart to beat 72 times a minute, this would give for the day's work of the left ventricle nearly 60,000 kilogram-meters. Calculating the work

of the right ventricle at one-fourth of the left, the work of the whole heart during the day would amount to 75,000 kilogram-meters." Foster's *Physiology*, p. 218.

The blood is the medium through which every cell of the body is supplied with its nutritive needs. In blood circulate the synthetized elements of the ingested food. In the capillaries, the blood-plasma filters through and fills the interstitial space, bathing every tissue in the lymph-fluid, from which the cells extract the nutritive materials they need for their sustenance and growth and to which they discharge their waste products. Without blood-circulation there can be no supply of the lymph fluid for the preservation of the tissues. This is easily seen in the occlusion of the main artery of the extremity when putrefactive fermentation takes place of an animal tissue still attached to the body, known as the 'gangrene' with the production of gases as sulphuretted hydrogen and volatilized fat, which gives the bad odor and the iron-content of the hemoglobin is precipitated into sulphide of iron which imparts to the limb a range of colors commencing in green and terminating in black.

In addition to supply the nutritive fluid to the cells, the chief function of the blood is to carry

oxygen with hemoglobin, hormones and glandular secretions for tissue respiration, oxidation, and stimulation and in the intercellular oxidation, heat of the body is generated. When the oxygen of the blood is reduced and it comes back to the heart through the veins to be sent to the lungs, to be charged with oxygen, it is of purple color, but when it is loaded with oxygen, it is sparkle bright-red. The venous blood contains many waste products of the cells, dissolved in it as the amonium carbonate, urea, urates, xanthin bases, carbonic acid as carbonates, cholesterin and other substances.

Charaka and Suśruta formed right conception of the function of the blood and the lymph in broad general outlines. Of course it was not possible for them to know their complex functional utilities in detail. Nor do we yet know. But they thought that the nerves were also tuberal vessels, through which flowed the vital force of life, something too fine for the eyes to see and which brought the sensory impressions to the central nervous system for co-ordination and carried the motor impulses to the periphery. It was invisible but mighty like the air which brings heat and cold waves, storms and tempests (*Charaka* 1. 12. 6) or like blowing with bellows which in-

tensifies the fire of the furnace and which it was compared to and identified with. But the exact nature of the nerve impulse and the mode of its conduction, is not yet completely understood. It is usually compared with the electric current. But the sensory and the motor nerves are different, the sensory fibres only bring impressions to the nerve-centre, while the motor only carry them from the centre to the periphery. Yet histological or chemical examination hardly reveals any structural differentiation. Moreover the propagation and the velocity of the nerve-force depends on the nature and locality of the nerve-fibre, the temperature and the pressure. The nerve-fibre is one of the units of a nerve-trunk : it is the axis-cylinder process of a neuron and is either medullated, that is, surrounded by a white substance called myelin, or non-medullated ; either the medullated or the non-medullated may or may not be surrounded by the primitive sheath or neurilemma, so that there are four forms of nerve-fibres. The neuron is the cell unit of the nerve-fibre and the neurons propagate their impulse by contact of the dendrites, the terminal arborization round the axon. The neurons also differ greatly in size, shape and internal structure and they are generally classified as the bipolar and multipolar cells.

This structural variation explains the difference in speed of nerve impulsion. Helmholtz found that the motor nerve of a frog travels with the velocity of 28 to 30 meters per second and the researches of Piper indicated that the motor nerve of a man travels at the velocity of 117 to 125 meter per second. There does not seem to be any structural difference between two afferent or efferent nerves, as for an example, between auditory and olfactory, and in their mode of conduction and speed, and if they carry different impressions and impulses, it is because their terminal endings have been developed to catch particular impressions and the lobe in the brain has been specialized as an economy to the system to receive, co-ordinate and react only to special impulses. It is just like two electric wires one of which has been connected to ring the bell and the other to make light.

By the specially adapted peculiar structure of the retina, the vibrations of light (color-images = *rūpa*) can be focussed upon it, setting up nerve-impulses that are transmitted by the fibres of the optic nerve and optic track to the visual centre in the cortex in the brain, which is situated in the occipital lobes, for co-ordination, color-consciousness and response to the stimuli. Total blindness

follows the removal of both occipital lobes. But if only one lobe is ablated or injured, there is a partial blindness, affecting the symmetrical halves of both eyes known as '*hemipia*'; the right one influencing the two right halves of the eyes, and the left one, the two left halves of the retinas.

The *outer ear* is so constituted that when the vibrations of matter, the rapidly alternating variations of pressure, what is commonly known as the 'waves of sound', forced through the acoustic apparatus, strike against the auditory epithelium, richly supplied with the nerve-fibres of the cochlear branch, and the sensory impulse thus generated is carried over the auditory nerve (eighth cranial nerve) and track to the auditory centre in the first convolution of the 'temporal auditory lobe,' where auditory consciousness is developed.

The *taste (rasa)* nerve fibres are distributed to parts of the buccal cavity and especially the tongue, of which the most sensitive parts are the tip, the borders, and the posterior portion of the dorsum in the circumvallate papillae. The anterior two-thirds of the tongue are supplied with sensory fibres from the lingual nerve (a branch of the fifth nerve) and the posterior third from the glossopharyngeal. The nerve track has not

yet been definitely known, but it is supposed to terminate in the hippocampal convolution, posterior to the olfactory lobe. The gustatory sensation is possibly complex. There are but four fundamental taste sensations,—namely, sweet, bitter, acid, and salty and the rest are but the combinations of these primary tastes, for the experience of which we are dependent on the terminal organs which are chiefly present in the fungiform and circumvallate papillæ. And there are so many complex and multiple junctions between the fifth nerve, the seventh nerve and the glossopharyngeal nerve, by way of the Vidian nerve, petrosal nerves, tympanic plexus, the otic and the splenopalatine ganglia, that it is hard to determine, how the taste sensation travels, but perhaps through the chorda tympani nerve.

In the *nasal septum* and a portion of the upper turbinate bone, the area corresponding to about 250 square millimeters in each nostril, there is a profuse distribution of the fibres of the olfactory (*gandha*) nerve, in the shape of elongated, epithelial like cells, each of which bears on its end a tuft of six to eight hair-like processes. And there are tiny glands which keep the mucous always humid and moist.

Particles of odoriferous matters, carried in a gaseous medium, namely the air, to the olfactory epithelium, become dissolved in the thin layer of fluid that keeps the nasal membrane moistened and this percolates through and stimulates the nerve-endings. But if the membrane be too dry or the secretion be too abundant or altered in quality, the power of smelling is diminished and even may be wholly suspended. The olfactory nerve terminates in the cortex of the brain in the '*cornu Ammonis* and *hippocampus*.' The animals with highly developed sense of smell possess a large '*limbic lobe*.' Some of the substances retain their odoriferous quality even in minute dilution as camphor 1 : 400,000 ; musk 1 : 8,000,000 ; vanilin 1 : 10,000,000 parts.

The touch (*sparsā*) is a compound sensation of pressure, warmth, cold and pain, through four distinct kinds of nerve-fibres which are not only richly distributed over the general cutaneous surface, but also in the buccal and rectal membranes. But the alimentary membranes, or the *superfaciæ* in the interior of the body are supplied with nerve-fibres of pain and devoid of those of touch and temperature sensations. Application of cocaine on the eye

or throat paralyzes the feeling of pain and pressure, but the sensations of heat and cold are not influenced, which proves that their nerve-fibres are different and mediate through different channels. It has been clinically observed that the compression of the cords of the brachial plexus, resulted in the insensibility of the arm to pressure and temperature, but not of pain. And it is supposed the nerve-endings of pain lie deeper than the tactile senses, which are superficial; the former mediating through the spinal cord and the latter through the posterior funiculi, together with some of the fibres of the muscle sense and they do not cross until after they reach the medulla and perhaps they are represented in the rolandic area.

The vocal sound or voice (*ghoṣa*) is distinct from speech, which is an articulate sound to express definite ideas. The animals are endowed with vocal power, but not with speech. And there may be speech without voice as in whispering and voice without speech as in singing a musical tone. The vocal organ, the larynx, resembles to a great extent the siren in the production of tone. The larynx is a framework of cartilages, connected with elastic ligaments, which are vocal cords, and it opens above into

the cavity of the pharynx and below into the trachea or windpipe. With respiration, the lung acts as bellows, pressing a blast of air through the thin tube of the windpipe and the escaped air is modulated by the movable ligaments into various tones. The voice has three characteristics, (1) 'loudness,' which depends on the force of the expiratory blast; (2) 'pitch,' which depends on the rapidity of vibrations and (3) the 'quality' which depends on the capacity of the resonance chamber and the muscular strength and pliability of the laryngeal ligaments (vocal cords). The alternate expansion and contraction of the ligaments and muscles of the larynx (*glottis*) are made by the bulbar and recurrent laryngeal nerves. If any of these nerves is destroyed, the rhythmic widening and narrowing automatically cease and the glottis remains immobile and no voice (vocal sound) can be produced.

There are four *speech (bhāṣā) centers*, situated along the Sylvian fissure, in the left hemisphere for the right-handed and in the right hemisphere for left-handed individuals. The motor center for pronouncing and articulating words, occupies the foot of the third frontal convolution (left), immediately in front of the

centers of phonation, utilized in speech. The destruction of this center produces motor aphasia (*aphemia*). In aphemia one is able to hear and to understand when spoken to, and is able to emit sound, to move the tongue and the lips, but he has lost his vocabulary, in other words, the faculty to articulate words. But if the injury is not complete, that is, in partial aphemia, the patient can utter a few incoherent words and syllables according to the nature of the lesion. The center for auditory images, that is, for comprehending spoken words, occupies the posterior fourth of the first temporal convolution (left). The destruction of this center causes sensory aphasia (word-deafness). In sensory aphasia, one can hear the voice, as the faculty of hearing is not affected, but he can not understand the spoken words, and the words are to him mere sounds and do not express any idea. The center for visual graphic images, that is, for distinguishing written or printed words, occupies the left angular gyrus (posterior inferior part of the left parietal lobe). The destruction of this center causes alexia (word-blindness). In alexia, one can not read even his own writing, although his vision and intelligence are not affected and he can see the form

of the letters, but has lost the faculty of comprehending ideas, expressed through those words. The center for the faculty of writing, is situated at the foot of the second frontal convolution and the destruction of this center produces the inability to write (*agraphia*). In *agraphia*, one has lost his faculty of expressing his ideas in writing or any graphic form. *Agraphia* is usually associated in clinical experience with motor aphasia (*aphemia*).

Sleep (nidrā) is evidenced by the cessation of sensory-motor reaction. Various hypotheses have been advanced to explain the causation of sleep. (1) Cerebral anemia was suggested by the old writers ; but it is rather the effect than the cause of it. (2) Hyposecretion of the thyroid due to the inhibitive action of the accumulative waste products during waking hours and the hyper-secretion of the pituitary body ; but in myxedema, drowsiness is not constant, nor is there any proof that in hypnotic or epileptic somnolence, there is any increased secretion of hypophysis, or diminished secretion of the thyroids. (3) Osmotic theory of Devaux, which tries to explain sleep due to the increased viscosity of blood, through dehydration, is not substantiated by observation, as in privation of

water—in thirst, the nervous system is rather irritated. (4) Chemico-toxic theory enjoys a better reputation. The accumulated tissue-waste products as lactic acid, cholesterine, leucomaine, exercise an inhibitory action on the cerebral activity, either paralyzing the centre directly, through intoxication or indirectly by reflex vaso-constriction. (5) Accumulation of carbonic acid which has an extrême avidity for oxygen, reduces the minimum ratio of free oxygen, necessary for the central nervous activities. (6) Consumption of the intramolecular oxygen causes cerebral asphyxia, which is expressed as sleep, as during the waking hours, the brain cells use up their store of oxygen more rapidly than it can be replenished by absorption from blood ; the consequence is that for lack of respiration, the brain-cells can not react to the sensory stimuli and gradually losing consciousness, store up sufficient oxygen through the anabolic process to be awakened up again. (7) The neuron theory tries to explain sleep on the histological principle that the nerve track is not continuous like the electric wire, but composed of the cell-units (neuron) which transmit their impulse from one to the other by their contact through the interlacings of dendrid-

ed and terminal arborizations, and when there is sufficient accumulation of fatigue products, the dendrites contract and retract, so that the nerve-path being broken and the brain being automatically relieved from sensory stimulation, sleep is mechanically produced. But it has not yet been proved that the dendrite processes are contractile enough as to lose all connections with the neighborly cells. (8) A central nervous mechanism produces sleep, not as a result of asphyxiation, toxins or neuro-toxins (*Bouchard*), but to prevent them and to protect the brain-cells from the evil effect of their further accumulation, so that during enforced involuntary rest, the obnoxious products can be eliminated and the brain-cells can be refreshed and revitalized through the anabolic process (the income of energy being more than its expenditure)—as an economic accommodation to self-preservation. If the sleep is deep, profound and undisturbed, it will take less time than otherwise to oxygenate, tonicize, recuperate and vitalize the brain-cells for the resumption of their activities of sensory-motor co-ordination and reaction.

Hunger and thirst (kṣut-pipāsā) sensations are mediated, probably through the nerve endings

in the stomach and pharynx. Normal hunger is known as the appetite and it is not yet definitely determined whether this impression is conveyed by sensory fibres, distributed to the mucous membrane of the stomach or of the muscular coat. When the stomach is empty, these peripheral nerve-endings are excited. That it has nothing to do with nutritive needs of the organism, is evidenced by the fact that when water or indigestible substances are taken in to fill the stomach, the hunger sense is allayed. From this, it can be concluded that hunger is a gastric sense. Of course, when there is a general tissue hunger for lack of nutrition, a general nervousness and discomfort are experienced, due to the resultant nervous excitation. The water needs of the body are experienced through the fibres of the glosso-pharyngeal nerve as an end organ of thirst, for we know, that if the pharynx is dried up either by salty or saccharine food, dried air or dust, at once there is a sensation of thirst, though there may be no bodily need for it and it can be appeased by removing the irritant substances and moistening the spot. It is possible that when the tissues give up their storage of reserve-water to compensate the loss of the blood, it constantly incurs through respiration, perspiration and

urination, there is a general call for supply of water, and it first expresses the demand through the excitability of the glossopharyngeal nerve, and if it is extreme through general nerve excitation and irritation, as in tissue hunger.

Sweat (sveda) is the secretion of the sudoripareous glands, of which, there are nearly two millions (*Krause*), distributed all over the cutaneous surface, except the glans penis, prepuce and the deeper portion of the external auditory meatus. It is known that with vaso-dilation, their secretion is increased. But it can be also produced independently, directly through the excitation of the nervous mechanism, as is seen in strong emotion, cold-sweat of phthisis and other diseases, when the skin is in anemic state. The stimulation of the sciatic nerve in cat, has been demonstrated to produce profuse sweating on the hairless balls of the feet. But when an animal with sciatic nerve divided on one side, is made dyspneic, no sweat appears on the hind limb of that side, though there is abundance in the other, thus clearly proving a central nervous mechanism, regulating sweat-glands as vaso-dilation. It seems that picrotoxin and strychnia induce sweating action by influencing the central nervous system while nicotin induces perspira-

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tion by acting both centrally and peripherally. As histologically and anatomically the nerve-fibers of the sweat glands and the vaso-constrictors resemble very closely, it is reasonable to presume, that like the latter, the central nervous regulator of the sweat glands is in the medulla.

Sebum (rasa) a semiliquid oily material, that is secreted by the sebaceous glands, distributed all over the cutaneous surface, chiefly associated with the hair follicle, but also without it as in the glans penis, lips and the deeper portions of the external auditory meatus, is meant possibly to protect the skin from bacterial invasion, and to prevent the hair from being brittle. Sebum on exposure to air forms a waxy cheesy mass as is seen in the comedones from the occlusion of the ducts, or in the glans penis (*Smegma preputti*) or in the auditory meatus (*cerumen* = ear-wax) and it contains fats, soaps, cholesterin, albuminous material (casein like), remnants of epithelial cells and inorganic salts. As the sebaceous secretive activities are associated with vaso-dilation, it is presumed that their nervous mechanism is the same, although sebum by its oil coating over the skin prevents the undue loss of heat as well as prevents the undue absorption of moisture. Vaso-dilation and vaso-constriction

are regulated by the nerve-fibres belonging to the sympathetic or automatic nervous system.

Heat (*uṣmā*) is produced as a reaction of the intracellular oxidation or vital process and absorbed in the blood, it is conveyed to every part of the body to preserve the temperature equilibrium of the hot-blooded animal. For heat is being constantly lost from the body through radiation (conduction), evaporation (perspiration from the skin), respiration (vaporization of water through lungs), and with urine and feces. If there is excess of heat, it is conducted to the periphery and is radiated with sweat by vasodilation. If on the other hand, the surrounding air is cold and the body needs to conserve its heat, there is vaso-constriction so that the escape of heat is reduced, as well as the production of heat is stimulated by increased oxidation. In cold-blooded creatures as fish, amphibia, reptiles or in the hibernating animals (*poikilothermos*), either the oxidizing process is not yet intense as in the former, or the heat-regulating mechanism is absent or poorly developed as in the latter, and the consequence is that their body temperature fluctuates with that of the surroundings. While the hot-blooded animal (*homoiothermous*) keeps relatively a constant temperature

independent of the surroundings. There is every reason to believe that the heat-regulating mechanism (tissue-oxidation for the production of heat, conservation of heat through vasoconstriction, and radiation of heat through vasodilation) is controlled by a nervous center, which perhaps is situated either in the pons or medulla.

III. PATHOLOGY

“Whatever causes pain, is a disease (*vyādhi*). Diseases are of four kinds : accidental or mechanical (*āgantū*), physical (*śārīra*), mental (*mānasa*), and natural (*svābhāvika*). Diseases caused by injuries are ‘*āgantū*’ ; of alimentary origin and by the derangement of the nervous, venous, lymphatic and arterial systems, ‘*śārīra*’ ; through anger, sorrow, fear, joyousness, sadness, jealousy, concentration of mind, misery, haughtiness, greed, envy, desires and longings, ‘*mānasa*’ ; hunger, thirst, senility, sleep and death, are ‘natural’ diseases”. *Suśruta* I.I. 20^{44a}.

“Again, the diseases originate from seven sources as follows: hereditary (*ādīvala*), maternal (*janmavala*), alimentary (*doṣavala*), mechanical (*saṃghātavala*), physical (*kālavala* = seasonal),

44(a). तद्दुःखसंयोगा व्याधय इत्युच्यन्ते । ते चतुर्विधा आगन्तवः शरीरा-
मागसा स्वाभाविकाश्चेति । तेषामागन्तवोऽभिघातनिमिताः । शरीराक्षुन्नपानमूला-
घात-पित्त-कफ-श्लेष्मित-सन्निपातवैषम्यनिमिताः । मागसास्तु क्रोध-शोक-भय-हर्ष-विषा-
द्वैर्जायमाना-दैन्य-मातृसर्व-शोभ-काम-प्रभृतय इच्छादिभेदैर्भवन्ति । स्वाभाविकाः
चतुर्पिपासानराद्यनुनिद्राप्र, तयः । सुश्रुत, स्वस्थानम्, १, २० ।

contagious (*daivavala*), and natural (*svabhāvavala*) *Sūtruta* I, 24. 4th.

“The diseases that are transmitted through the lesion in the sperm or the ovum of the parents, are hereditary, as ‘*kuṣṭha*’ (leprosy—there is every reason to believe that the syphilitic eruption of the skin and ulceration were regarded as varieties of leprosy) and ‘*arśa*’ (hemorrhoids). The hereditary diseases are of two kinds and might come either from father or mother’s side.

“The diseases that are produced through the improper regimen (*apachara* = wrong food and injurious exercise) of the mother (during the intra-uterine life of the fetus) are called maternal as born—lame, blind, deaf, mute, ‘*minmina*’ (one who speaks with a hissing nasal accent, due to overgrowth of adenoid tissue in the rhinopharynx) and the dwarf. These diseases (acquired during the intra-uterine life) are caused by either) mother’s (defective) circulation (*rasakṛta*) or miserable living.

“The diseases that are produced through improper food and living, or (reacting through

45. तत् तु सप्तविधे व्याधावुपनिपतति । ते पुनः सप्तविधा व्याधयस्तद्व्याधा—
आदिवलप्रवृत्ता जन्मबलप्रवृत्ता दोषबलप्रवृत्ताः संघातबलप्रवृत्ताः कालबलप्रवृत्ता
दैवबलप्रवृत्ताः स्वाभावबलप्रवृत्ता इति । सुश्रुतसंहिता, सूत्रस्थानम्, २४, ४ ।

digestion) anxiety, are '*alimentary*'. Alimentary diseases are of two kinds—gastric and intestinal occasioned by physical causes (as improper food and living) or mental causes (as anxiety, fear or nervous excitement).

"(The diseases occasioned by) the injuries struck with force on the weak, are '*mechanical*' whether by instruments or by ferocious animals.

"The diseases that are produced by cold, heat, wind and rain, are '*physical*', whether (they) are natural or unnatural.

"The diseases that are produced by the tyranny of the gods (through thunder and lightning), through curses (*phobia*), sorceries of the *Atharva-veda* (infectious diseases), and through contagion (syphilis) are *daiva-vala* (god-sent, i. e. beyond human control). These diseases are of two kinds as occasioned by thunder-lightning or by demons (infectious diseases as cholera or small-pox). And again they are of two kinds—through accident (as thunder-lightning) or through contact (as syphilis).

"Hunger, thirst, senility (old-age), sleep and death etc. are natural diseases. They are of two kinds—timely or untimely. They can be cured

when they are untimely (i. e. if there is hunger, thirst or premature senility, when there is no reason for it, they are proper subjects for treatment), but not so when they are timely."

Suśruta 1, 24. 5-7th.

"In addition to (parasitic) animalcules (that cause disease), there are twenty kinds of microbes (*krimi*) divided into four classes." *Charaka* III. 7. 6th.

"The origin of the microbes of the blood-vessels (veins), is like that of leprosy. Their

४६. तवादिबलप्रकृता ये शुक्रशोणितदोषान्धयाः कुष्ठार्शःप्रथतयः ; तेऽपि त्रिविधाः मादजाः पितृजाश्च । जन्मबलप्रकृता ये मातुरपचारात् पञ्चजात्यन्धवधिरमूकमिन्दिन-
बालनमभृतयो जायन्ते ; तेऽपि त्रिविधा रसकृता दौष्टदापचारकृताश्च । दोषबलप्रकृता
य आतङ्गसमुत्पन्नाः मिथ्याहाराचारभवाश्च ; तेऽपि त्रिविधा आमाशयसमुत्पन्नाः पक्वाश्व-
समुत्पन्नाश्च, पुनश्च त्रिविधाः शारीरा मानसाश्च । एत आध्यात्मिकाः ॥५॥

संचातबलप्रकृता य आगन्तवो दुष्कृतस्य बलवद्वियङ्मात् ; तेऽपि त्रिविधाः शस्त्रकृता
व्यालादिकृताश्च । एत आधिभौतिकाः ॥६॥

कालबलप्रकृता ये शीतोष्णवातवर्षाप्रभृतिनिमित्ताः । तेऽपि त्रिविधा व्यापन्नचतुर्कृता
अव्यापन्नचतुर्कृताश्च । दैवबलप्रकृता ये देवद्वीडादभिमतका अथर्वकृता उपसर्गकृताश्च, तेऽपि
त्रिविधा विषुद्वशकृताः पिशाचादिकृताश्च, पुनश्च त्रिविधाः संसर्गज आकस्मिकाश्च ।
स्वभावबलप्रकृताः क्षुत्पिपासाजराहृत्युनिद्राप्रभृतयः ; तेऽपि त्रिविधाः कालकृता अकाल-
कृताश्च । तत्र परिरच्यकृताः कालकृता अपरिरच्यकृता अकालकृताः । एत
अधिदैविकाः । तत्र सर्वव्याध्यवरोधः ॥७॥ सुश्रुतसंहिता, सूत्रस्थानम्, १४, ५-७ ।

४७. त्रिविधविधाः क्रिययः पूर्वमुद्दिष्टा नानाविधेन प्रविभागेनाम्बल सङ्कीर्णः ।
ते पुनः प्रकृतिनिर्विभज्यमानास्तुर्विधा भवन्ति । अरकसंहिता, विमानस्थानम्, ७, ६१

habitat is the blood-vessels. They are very minute, globular and without feet. Many of them are so minute that they are invisible." *Charaka* III. 7. 7th.

Pathology or the science of disease, has up to the last century, been rather vague owing to the complexity of reaction of the pathogenic agents upon the living matter. Bacteriology is entirely a modern science. A few years ago it was not even suspected that infectious diseases are due to the intervention of morbid microbic agents. Their very existence was not even known. Microscopy and chemical reagents have but recently revealed the most interesting teeming world of animalcules, which though invisible to the naked eye, are no less potent adversaries of the living beings, and there is a constant struggle between life and these invisible foes, to which it ultimately succumbs, and in spite of the relentless war of science for the last generation, it has not been able, but partially, to conquer and to control them. Even the diseases that we call organic, as the cardiac

48. शोषितजालान् कुष्ठैः समानं समुत्थानम् । स्थानं रक्तवाहिनीं धमन्यः
संस्थानमवरो हतावापादाश्च । सुखत्वाच्च एको भक्ष्यहृत्प्राः । अरक्तसंज्ञिता, विमान-
स्थानम्, ७, ७ ।

affection, or metabological as gout, may be the manifestations of the accumulated reactions of pathogenic germs, which have disappeared long ago, as pneumococci and gonococci respectively. This is clearly seen in *tabes dorsalis*, as a sequel of syphilis, after twenty or thirty years of infection.

The ancient conception of disease was based more or less on humoral pathology, i. e. disease originated from the derangement of the humors and it was the function of the diet and medicine and proper living, to bring them back to their normalcy and equilibrium. According to the Hindu schools of medicine, there were three fundamental humors (*vāyu*, *pitta*, *kapha*), according to the Greek, four (blood, phlegm, bile and water by some, yellow and black biles by others) in the human body. '*Vāyu*' is the active principle like the wind, which brings hot and cold waves ; '*pitta*' is the heat principle like the sun ; and the '*kapha*' is the cold principle like the moon, whose beams were reputed to exercise a very soothing and beneficial influence on plant life, in contradistinction of the sun's rays which were supposed to have a scorching effect, as it usually happens in an arid tropical climate. (*Suśruta* 1. 21. 8). As for the luxuriant vegetable life and

growth, all these three elements in their right proportion are necessary, and excess of either, heat, cold or wind, is injurious to the plant, as in the animal kingdom.

However fanciful and grotesque this appears at the first glance to the moderner, it is not really so when it is seen with clear perspective and sharp analysis. It is true that concrete facts and statements appeal more to reason than vague generalization and abstract philosophy. But by close observation it will be easily observed that their '*vāyu, pitta, kapha*' correspond, to what is expressed in vulgar terminology, as '*nervous, sanguine and phlegmatic temperaments* and which can be translated into medical nomenclature as '*hypermetabolism, normal metabolism and hypometabolism.*' The following citations tend to lead to the aforesaid conclusion :—

“The bodily oxidation (*agni*) is classified into four kinds according to its activities as follows :— hyper- (*tikṣṇa*), hypo- (*manda*), normal (*sama*) and abnormal (*viṣama*). Of them (one of) hypermetabolism is able to bear all abuses (i. e possesses a great resisting power against infection) ; hypometabolism has its opposite qualities ; normal metabolism becomes (easily) upset by abuse, but without abuse, remains

natural ; abnormal metabolism has the opposite qualities of the normal.," *Charaka* III. 6. 6^o.

"These four kinds of oxidation pertain to man. Those who have *vāyu*, *pitta*, *kapha*, in propotion (equal), enjoy normal oxidation. In the case of those who have predominance of *vāta* (nervous temperament), oxidation beomes abnormal by association with *vāyu*. In those who have predominance of *pitta* (sanguine temperament), oxidation becomes accentuated by its association (hyper-oxidation). In those who have predominance of '*śleṣma*' (phlegmatic temperament), their oxidation becomes lowered by its association (hypo-oxidation)." *Charaka* III. 6. 7^o.

"The dominant qualities at the time of union of

49. अग्निषु तु शारीरेषु चतुर्विधो विशेषो बलमेदेन भवति । तद्यथा तीक्ष्णो मन्दः समो विषमश्चेति । तत्र तीक्ष्णोऽग्निः सर्वापचारसङ्घः, तद्विपरीतलक्ष्यस्य मन्दः, समस्य खलपचारतो विकृतिमापद्यते, अनपचारतस्य प्रकृतावेवावतिष्ठते । समलक्ष्य-विपरीतलक्ष्यस्य विषमः । अरकसंहिता, विमानस्थानम्, ६, ६ ।

50. इत्येते चतुर्विधा भवन्नाग्नयश्चतुर्विधानामिव पुरुषाणाम् । तत्र समवात-पित्तश्लेष्मणाम् प्रकृतिस्थानां समा भवन्नाग्नयो वातलानान् वाताभिभूतेऽग्न्याधिष्ठाने विषमा भवन्नाग्नयः । पित्तलानान् पित्ताभिभूते अग्न्याधिष्ठाने तीक्ष्णा भवन्नाग्नयः । श्लेष्मलानान् श्लेष्माभिभूते अग्न्याधिष्ठाने मन्दा भवन्नाग्नयः । अरकसंहिता, विमान-स्थानम्, ६, ६ ।

the sperm with ovum, are inborn (with the baby), as temperament (*prakṛti*). *Suśruta* III. 4. 48⁵¹.

“The man of nervous (*vāta*) temperament, is sleepless (*jāgaruka*), sensitive to cold, ill-tempered, exclusive (*stena*=thievish), haughty, unmannerly (*anārya*=un-arian), fond of music, songs, dance and arts (*gandharvachitta*), whose hands and feet are long, whose beard, hair and nails are very dry, who is excitable (*krodhālu*=angry) and strike people with hand and nails. That person is impatient, whose friendship is unstable, (who is) ungrateful, thin, violent, whose veins show out throughout his body, (who is) garrulous, who walks fast, is fond of walking and is fickle-minded.” *Suśruta* III 4. 59⁵².

“The man of sanguine temperament (*pitta*) perspires freely, smells come from his body (from volatile oil), his body has the yellowish color

51. शुक्रशोणितसंयोगे यो भवेद्दोष उत्कटः ।

प्रकृतिर्जायते तेन तस्या मे लक्षणं भवति ॥ सुप्तसंज्ञिता, शरीर-
स्थानम्, ४, ५८ ।

52. तत्र जागृकः शीतदोषो दुर्भगः क्षेणो मत्सर्ग्यनार्यो गान्धर्वचित्तः कुटिल-
कारचरणोऽतिरुच्यश्च सुखकेशः क्रोधो दन्तलङ्घ्यादी च भवति ॥

अधतिरद्वदसीददः कृतज्ञः कुशपरुषो धमनीततः प्रलापो ।

द्रुतगतिरटनोऽनवस्थितात्मा विद्यदपि गच्छति संभवे च सुप्तः ॥ सुप्तसंज्ञिता,
शरीरस्थानम्, ४, ५९ ।

and is relaxed ; and his nails, eyes, forehead, tongue, cheeks, and palms of hands and soles of feet are copper-colored (indications of good circulation of blood) ; he becomes repugnant when he gets wrinkled (*vali*), gray-haired (*palita*) and bald-headed (*khālitya*) : he is a voracious eater, sensitive to heat and he becomes easily angry and easily satisfied ; his strength and longevity are medium. A man of sanguinary temperament is brainy (*medhāvī*), clever and is an authoritative speaker ; in combat he is brave and irresistible.” *Suśruta* III. 4. 61⁵³.

“The complexion of a man of phlegmatic (*śleṣma*) temperament, is like the grass, blue lotus blossom or wet *ariṣṭa* (soap-tree), sharpened sword or the shaft of an arrow (i. e. fat and bright.) He is pleasant to look at, fond of eating sweet things (it is well-known that in myxedema or cretinism there is a great fondness

53. स्वेदनी दुर्गन्धः पीतश्लिथिलाङ्गसायनखण्डनतालुजिह्वीउपाधिपादतलो दुर्भगो बलीपणितखालित्यजुष्टो बहुभुगुण्णवो धी क्षिप्रलोपप्रसादो मध्यमबलो मध्यमापुण्य भवति ॥६१

मिथानी निपुणमतिर्विशिष्टा वक्ता

तेजस्वी समितिषु दुर्निवारवीर्यः । सुश्रुतसंहिता, शारीर-

स्थानम्, ४, ६१ ।

for sugar and high tolerance for carbohydrates), obliging, lazy, patient, without desires, heavy, indifferent and thick-bodied." *Suśruta* III. 4. 65⁵⁴.

One can see here almost the true clinical picture of hyper-thyroidism in an advanced state, in the primary stage and hypo-thyroidism. Thyroid influences metabolism. With metabolism is inter-locked the automatic bodily mechanism of self-defence against infection. It is well-known that our integuments and mucous membranes swarm with innumerable pathogenic germs which almost live a harmless, vegetative parasitic life, but if the organism is devitalized by overwork or malnutrition, if its immunizing resisting power is lowered, in other words, if its defensive mechanism has been weakened, then infection takes place. We inhale almost with every inspiration plenty of *bacillus tuberculosis* and they lodge in our nostrils and lungs, we harbour in our intestine enough of *coli-group*, but they can not do any harm as long as our metabolic activities have not been lowered

54. दृब्धोन्मीवरनिस्त्रिंशद्वांरिष्टशरकाष्ठाणामन्वतमवर्णः सुभगः प्रियदर्शनो मधुरमिवः कृतशो धृतिमान् सङ्क्षिप्तुरसोक्षुपो बलवाग्बिचरयाही हृदयैरव भवति ॥ सुश्रुत-संहिता, शारीरस्थानम्, ४, ६५ ।

beyond the danger point. So far pathogenesis, vitality of the organism, is the important factor. This vitality classification, coefficient with metabolism and oxidation, is practically synonymous with *vāyu* (= air) as a conductor of hot and cold waves, *pitta* (= heat principle), *kapha* (= cold principle), which we are justified to translate as the nervous (*hypermetabolism*), sanguine (*normal metabolism*) and phlegmatic (*hypometabolism*) temperaments, and on which the whole system of the Hindu medicine is based. If there are points in which the picture drawn by Charaka varies from modern clinical observation (as bad smell and premature senility in sanguine temperament, and strength in phlegmatic type), it should not be forgotten that, there have been evolutive changes with time both in the pathogenic agents and our system, from the time of the ancients and consequently reactions have been partially modified. Moreover, it is good to remember that for the age in which Charaka and Suśruta lived, their studies strike our admiration from the comparative historical point of view, but for modern practical needs, they are nothing but crude and vague generalizations.

I. CONSTITUTIONAL PATHOGENESIS

We can quite agree with Suśruta (I. 120) that 'whatever causes pain, is a disease'. But the definition will be more logical and correct if we say, "Disease is the state of body and mind, produced in the organism, by a morbid agent and the organism reacting against it."

It is yet controversial whether infections are transmitted by heredity (*ādivala*). According to Weissman (*gemules* of Darwin and *plastidules* of Haeckel are now practically discarded as bearers of heredity) the germplasm is a bridge between the past and the present, linking man to the first-developed unicellular existence. The germplasm or the germinative cell assures the continuity of life and progress. In the lowest step of the ladder in animal life, among protozoa, reproduction takes place by fission, budding or both combined when the mother cell, through excess of nutrition divides into two as a relief of cellular tension. With the growth of organic life and specialization of cells as an economy for functional utilities, special cells (*gamets*) have been developed for reproduction. In further evolution, gamets have been differentiated into female gamet (*ovum*) and male gamet

(*spermatozoon*). Their amphimixis tends to cause variation, while the germ-plasm tries to conserve the type. Hence inspite of infinite variety, never two beings being the same, there is a fundamental unity of the species, as modifications are very slow.

The germplasm—the bearer of heredity, is the “*chromatin*” substance of the reproductive cell-nucleus. The chromatin divides into chromosomes (*idants*) and when they break up again, the smaller units are called chromomerés (*ids*) and each chromomere or ‘*id*’ contains all the dynamic potentialities—generic, specific, individual, which under appropriate nutrition and temperature, forms the organism. Each ‘*id*’ is surrounded by hypothetical units, called the ‘*determinants*’ and determinants by ‘*biphores*’ which are supposed to exercise the directing influence in the development of phylogenic evolutive transformations. Though immortality of the germ-plasm can be maintained without amphimixis, as in parthenogenetic eggs or by artificial parthogenesis in normal ova as demonstrated by J. Loeb, in higher plants and animals however, sexual conjugation is the normal process. Conjugation or fertilization means the reducing division of the chromosomes and the restoration of the normal bulk in the fertilized

ovum by equal contribution from both the parent cells. The stimulus which activates the fertilization is a chemotactic substance liberated by both the cells, but it seems that if the ovum is stronger as in the final stage, there is a protoplasmic outgrowth towards the spermatozoon. The protoplasm contains nutritive materials for the embryo.

Inheritance of heredity is complicated by two factors. Somatic characteristics are not transmitted—but only germinal. Yet the germinal materials are influenced by somatic behaviour or functional uses. One might lose his limbs and his children would not be born without them. The Jews have been practising circumcision for the last four thousand years, yet the Jewish male babies are born with prepuce. But according to the experiments of Brown Sequard, if the sciatic nerve of a guinea pig be cut, the animal becomes epileptic and if mated, brings forth offsprings that are epileptic, though the sciatic nerve is there and has not been severed, but its functional disturbance has been fixed by heredity.

Somatic cells undergo the evolutionary modifications of the functional exercise of an organ, by which its development is regulated. Therefore the hereditary transmissions are of two kinds, germinal and epigenetic, i. e. the germplasmic ma-

terial becomes influenced and modified by the somatic behaviour, that is, by external conditions. And though the amphimixis takes place, the characteristics of both the parents are not equally blended in the offspring. It might receive the prepotent characteristics of one as in a cross between a Negro with a White, pigment and hair etc., or the recessive characteristics of the other. The sex of the offspring, according to some, depends on the maturity of the ovum, and if the fertilisation takes place in the beginning, it is male and if at the terminating period of the catamenia, it is female. If the twins are not of the same sex, it is because two ova have been fecundated at two different periods. Consanguineous marriages produce evil effects, for heredity fixes and accentuates the weak characteristics of both the parents. If a blind man marries a blind woman, there is a possibility that the offsprings of the mating would have defective eye-sight, if they are not born totally blind, but if a blind man marries a woman with good eye-sight, the negative characteristic of one would be counterbalanced by the other and children born of that marriage would not be affected probably in their eye-sight. Of course, the laws of heredity are not so simple. According to some biologists, one does not inherit more than

50 p. c. from the parents, i. e. half from the father and the mother, each one of the parents contributing about one-fourth, and each one of the grand-parents one-eighth and so on according to the geometric regressive proportion. But there may be also sudden reversion to the ancestral type and what is known as '*atarism*.' So no fixed rules of heredity can be determined. But it is certain that the parents transmit to their offspring their psychic and bodily impressions. For germ-plasms must be certainly very sensitive to the somatic impressions and transformations.

We have no definite proof that the pathogenic germs are directly transmitted with the germ-plasms. For if really the ovum or the spermatozoon be infected, then they would be incapable of fertilization, growth and development, lacking impulsive momentum, vitality and nutrition, necessary for amphimixis and embryonic formation. The frequent abortion that takes place in the primary state of syphilis, is not probably due to the presence of *treponema pallidum* in the germplasms, but due to their low vitality and exhausted condition of nutrition or the invasion of the embryo by the pathogenic germs through the placenta. Of course, there are cases known in medical history where the

offspring has been born with all the stigmata of syphilis, acquired from the father, while the mother has acquired immunity from its infection from the fetus through gradual elaboration of the antibodies, as a reaction of the organism. But it does not necessarily imply that the spermatozoon that fertilized the ovum and caused conception, had living syphilitic germ in it, or it might have been simply saturated with attenuated syphilitic virus—mild enough not to interfere with embryonic and fetal growth, yet a sufficient cause to bring forth immunizing reactions in the maternal organism, without infecting her. In the matter of hereditary transmission of infectious diseases, the question is whether the germplasms can be carriers of infective microbes? In this the father is concerned only at the time of conception. Of course at the time of copulation and conception, the father's state of health and condition, are reflected in the offspring. If the father is youthful, healthy and in happy mood, the offspring acquires a gay and cheerful disposition of mind. If on the contrary, the father is aged, or suffers from dyspepsia, malaria or liver troubles, which naturally create a melancholy frame of mind, the children inherit the appearance of premature senility. The children of youthful parents

usually inherit a mobile and agile nervous system, as in youth nerves are very sensitive and responsive to impressions. The children of gouty, tubercular or hemophiliac parentage acquire a diathetic predisposition to these diseases. In an arthritic family often are seen manifestations in different members of the family of gout, eczema, nervous affections, hepatic and renal lithiasis, diabetes and Bright's disease. But there is no conclusive evidence that the germ-plasm is a carrier of infectious germ.

But the mother's influence is much more preponderant. The fetus lives and grows in the mother's womb as a parasite for eight to ten months. For its nutrition it is dependent on the maternal circulatory system. Spermatozoon practically acts simply as a stimulant and gives the momentum to the ovum to start its anabolic evolutionary course. The child is really formed of the mother's nutrition. So her psychical and physical life vitally reflects in the formation and growth of the fetus, during the long period of gestation. If she has any infectious disease, it is very unusual, if she does not transmit it to the fetus through the placenta.

Nutritional (*doṣāvala*) disturbances are many and varied, and are known as metabolic

diseases. Nutrition is the function of every living cell, consisting in the taking in and assimilation through fermentative changes, whereby tissue is nourished and built and energy is liberated : its successive stages are known as digestion, absorption, assimilation, disassimilation and excretion.

Anabolism is the assimilative synthetic process, while catabolism is the retrograde disassimilative metabolism. For both these functions a liquid medium is necessary in which the nutritive substances can be in a soluble state, so that by osmotic pressure, it can percolate through the capillary wall and enter into interstitial space, from which the cells extract their food needs by endosmosis, and by exosmosis, throw out the metabolic waste products formed in the organic synthesis into the lymph stream. If any of the waste products be allowed to accumulate, the organism would die out of auto-intoxication.

So nutrition comprises various functions. (1) Transmission and transformation of food in the alimentary canal by the digestive enzymes, from insoluble into soluble products so that they become dialyzable: starches are saccharified, albumines are peptonised and fats are partly emulsified

and partly split up into fatty acids and glycerine. (2) Absorption of the digested soluble nutrients. (3) Detoxication, synthesis and fixation of the nutrients in the liver, especially the glucose, which is converted into glycogen. (4) Transportation of the nutrients with the blood-circulation to every tissue of the body for the food-supply of the cells, the extraction of the food-material from the plasma by the cells, and ejection into it of the waste-production of catabolism. (5) Regressive metamorphosis and reduction of harmful disassimilative products into harmless substances, chiefly in the liver as the conversion of the nitrogenous end-products into urea. (6) Elimination of the metabolic wastes through the kidneys, lungs and the skin. It has been estimated that an adult voids daily 250 grams of carbon and 18 grams of nitrogen. This must be replaced to preserve the equilibrium between the income and the expenditure of the bodily energy, or it will slowly starve to death.

Death takes place through starvation, when the body has lost nearly 45 per cent of its weight. When food is withdrawn, the organism performs its multifarious functional activities, as the pulsation of the heart, metabolism, respiration, maintenance of the body tempera-

ture, muscular contraction and excretion of waste products, by consumption of the body fat and protein, sacrificing the less useful to the more useful in the economy. Death is postponed if plenty of water is taken, for it maintains the integrity of the circulatory system and aids in the transportation of the metabolic wastes for expulsion from the body. Without sufficient consumption of water, the increased viscosity of blood and the retention of the toxic excretory substances hasten death. However, death through absolute starvation is very rare. But death through malnutrition—insufficiency or bad quality of food, especially during famine—is very common, indirectly or directly. Malnutrition weakens the vital resisting power of the organism and clears the way for the invasion of epidemics, which is usually the case, or death is slowly preceded by gradual emaciation, anemia, dropsy, cardiac and cerebral disturbances, especially delirium.

If the aliments are too abundant or of bad quality, the undigested food falls an easy prey to microbes that swarm in the alimentary canal, provoking fermentation and putrefaction, thus causing dyspepsia, lientery auto-intoxication, dilatation and catarrh of the digestive tube. In

the children, it is manifest by gradual emaciation, nervous irritability and erythema of the buttocks, vulva and thighs. But even if it be digested and absorbed, overnutrition is liable, with excess of carbohydrate consumption to engender glycosuria, if it be coupled with hepatic and pancreatic insufficiency, with excess of protein consumption into peptonuria and albuminuria with hepatic insufficiency under certain pathological conditions. The evil effects of over-nutrition did not escape Charaka. For he says: 'If any one accustomed to day-sleep and the comforts of bed (i. e. does not take sufficient exercise) indulge in excess of oily, sweet and slimy substances, new rice, new wine, meat, fish, milk, butter, and cakes, he becomes subject to many diseases. If he does not reduce (the excessive consumption) of restorative dishes, he will suffer from diabetes (*prameha* = glycosuria and albuminuria), cutaneous irritation (*kanḍu*), pain (*gouty*), eczema (*koṭha*), jaundice, fever, leprosy, alimentary diseases, strangury (*mūtra-krchchhra*), loss of appetite, lassitude (*tandrā*), impotence, emaciation, lethargy, heaviness of the body, burdening the circulatory system with waste products, dullness of sense-impressions, mental cloudiness, drowsiness (*pramīlaka*),

edema (*sotha*), and other diseases." *Charaka*
I. 23. 1-5^{ss}

II. MECHANICAL PATHOGENESIS.

Mechanical (ādhibhautika) agents can be the means of causing bodily suffering and death in various ways under different circumstances. If a man falls from a tree, the injury would depend on the pressure of contact, based on force (weight, height of the position and the gravitation of the earth, as well as the nature of the ground). Even one can suffer fatal injury, especially to the nervous system, by the rapid vibration of air, as near the passage of a high-speed projectile, of which there have been numerous victims in the recent war and it is known as '*shell-shocks*'. Whatever may be the injury, it is due to the conflict of power and resistance. When one falls from a tree, he is the body in motion : when a sword or a bullet strikes him, he is the resistance. The injury on the wound depends on their mutual relation. One might strike another with a sword, lacking force without causing more than a bruise, but the same

55. प्रवृत्तिनिष्ठ मरणां भौतिकीं वैशिष्ट्याः

चक्रवर्तनदीर्घः शौरिस्ताञ्जालु तिष्ठः । चक्रवर्त'हिता, सुवर्णान, २२, १—५ ।

sword can cut him in twain, if struck with vigor. The nature of a wound depends on the instrument and the force with which it is struck. With sharp-pointed instruments as the needle, pin, cannula of hypodermic syringe, sting of certain insects and scorpions, any wound is called the '*puncture*' and puncture is usually harmless. Even the heart can be punctured without any serious consequence. Neither is the puncture of the nerve serious, unless the vital centres are penetrated which might cause sudden death. A bruise in the soft parts without a break in the skin is called '*contused wound*' which heals very quickly. A clean cut with a sharp instrument is called the '*incised wound*' and though there is profuse bleeding as long as the incised parts are not tightened together, it heals rapidly usually without infection. Lacerated wounds are those which are inflicted with a blunt instrument or by biting of animals. They generally take a long time to heal, as it is very hard to keep the torn out tissues in aseptic condition. The seriousness of a gun-shot wound depends on three factors, namely, the point of entrance, the tract and the point of exit. When the bullet has lodged in the tissues of the body, the tract is known as '*blind*'. The wound at the point of entrance is always smaller, due to the

contractibility of the tissue than the aperture of the exit, as it is more subjected to pressure and distension and is consequently more or less lacerated whether the tract of the bullet is direct or tortuous. When a bullet lacks a great velocity, it slunts by, if it meets a bone and becomes tortuous, but if it be driven with a great force, it might drill clear through a bone or cause a fracture and impart to the fragments sufficient momentum to act as glancing missiles and aggravate the lesion. The wounds caused by explosives are more serious, as aside from the mechanical effect, the tremendous sudden increase of pressure and temperature, as well as the liberation of toxic gases cause a very severe nerve shock. In any gun-shot or explosive wound, it is the nerve-shock, that is the serious matter. Otherwise in a simple wound not affecting any vital part in the economy, if there is no introduction of any septic matter, and bleeding can be arrested and suppuration prevented, there need not be any fatal consequence.

The physical (*kāla-vala*) agents are many as heat, cold, air-pressure, sudden seasonal changes, dazzling light, the sun (sun-stroke), sound and electricity. It seems that the human organism can stand cold much easier than heat. Of course

with the rising temperature, metabolism is slowed up and the consequence is less oxidation, which means in other words, less production of heat. And there is vaso-dilatation, and the blood rushing to the periphery loses part of its heat by radiation in the surrounding atmosphere, and with the evaporation of perspiration, there is not only further loss of heat, but also a noticeably cooling sensation. However, when the evaporation from the skin is not rapid as in humid heat, it is more unpleasant. The dog or the cat whose body is covered with hairy coating and can not perspire freely, put out their tongue, execute rapid respiratory movements and thus facilitate evaporation through their gustatory organ. But when due to excessive consumption of alcohol, the vaso-motor mechanism does not react, or due to burn, perspiration is interfered with, or in the close overheated chamber near a furnace or boiler, prostration comes with high fever, rapid pulse, stertorous respiration, hot and dry skin and delirium. Perhaps this symptoms-complex is due to the chemical change in the nerves, brought about by excessive heat and not to the coagulation of myosin as it was supposed before. Exposure to the strong sun for a long time, principally the unprotected head, affects the

nervous mechanism directly, especially in one who has not been gradually accustomed to it, by the penetrating actinic rays, creating perhaps molecular changes in the nerve-cells. The prostration is extreme, rapid and sudden, but often the high temperature is missing, though in other ways, the symptoms are those of heat-stroke. Though cold can be better borne than heat, yet after heavy consumption of alcohol, which causes vaso-dilatation and consequently loss of heat, one can be easily frozen to death. The action of cold is intensified by humidity which absorbs a good deal of heat and wind which drives away the warm layer of air surrounding the body. Even a healthy person with prolonged exposure to cold and sudden fall of temperature, might get a frost-bite. The frost-bite is manifest in the first stage by erythema and rubefaction, in the second stage by ulceration and finally by eschars, entailing the loss of the organ. Even when it does not directly cause any lesion, indirectly in a weak, debilitated or undernourished organism, it causes the development of various germs as pneumococci; or there is an irresistible tendency to sleep from which one hardly wakes; or the physical and mental apathy may be interrupted by cerebral derange-

ment and delirium, and one dies of heart-failure. The influence of the variations of the atmospheric pressure is not very negligible. At the sea level, the air exerts a pressure of 1.03 kilogramme per square centimeter, that is, about 18,000 kilogrammes for the human body. When a man makes an abrupt ascent to a high altitude in an aeroplane or makes a descent as a sea-diver, the sudden pressure variation is apt to cause various disturbances. At the sea level, at zero altitude, there is a barometric pressure of 76 centimeter of mercury ; in Cashmere at the altitude of 7,000 feet, 56 ; at Mt. Everest at the altitude of 29,000 feet, 24.8. If a deep-sea fish is brought to the surface, it bursts from the expansion of the gas contained in the fish, so a man by a sudden high ascent not only finds it hard to breathe owing to the rarefaction of the air and consequent diminution of oxygen, but also the intestinal gases expand and cause tympanites and the blood rushing towards the periphery provoke diverse disorders from the results of anemia of the internal organs. At the altitude of 2000 meters, the oxygen diminishes 13 per cent ; at 3000, 21 per cent ; at 6500, 43 per cent and at 8500, 50 per cent. To counteract this influence, the aeronauts are supplied with

oxygen tanks, and the deep sea divers with compressed air to two or three atmospheres. The benefit of a mountain resort is in the purity of air and its higher ozone content. But above 11,000 feet, one who is not accustomed to high-mountain climbing, mountaineering may provoke '*mountain sickness*' with a symptom-complex of giddiness, nausea, dyspnea, headache, thirst, malaise and a slight rise of temperature, almost like the sea-sickness, and with weakness of heart may prove fatal. But when a deep-sea diver comes to the surface, he feels a buzzing sensation in the ears, due to the difference of pressure between the two surfaces on the tympanum, and this difference may be sufficiently great to cause rupture of the membrane, and there is a complaint of great fatigue and tendency to fainting. If the reduction of pressure is rapid, there is hemorrhage from the nose, ears and lungs and on the skin in puntiform shape, which the divers designate as '*flea bites*.'

Light is visible between 497,000,000,000 and 728,000,000,000 vibrations per second. Below or above this figure, there is no sensory impression. Yet within this narrow limit of our visibility, we can see that light plays an important part in stimulating our nervous system and

general metabolism and killing many of the microbes exposed to it. It is well known how the sun light activates plant growth. Under its influence, carbonic acid—a waste product of the cellular metabolism, is made to unite with water—and thus reconstituting a hydrate of carbon—which is the principal mainstay of energizing food supply of human beings and herbivorous animals. And though light is used very effectively as a valuable therapeutic agent in dermatosis, a strong light might cause erythema and reflected light, either from sand as in the desert or snow, might provoke opthalmia and blepharitis. The harmful effects of light can be avoided by using blue or black glasses over the eyes, and covering the body, especially the head with black or blue cloth through which the ultra-violet rays can not penetrate and to which the irritation is due.

Sound is only audible within the close range of 30 and 30,000 vibrations per second. Prolonged harsh sounds may cause mechanical lesion, even perforation of the timpanum and reflexibly nervous irritation. The soothing and restorative effect of the mountains and country places is often in the freedom from noise. And music which is nothing but the harmony of

sound, is now well recognised as an important therapeutic agent for calming and soothing nervous irritation and in various other nervous derangements.

The nature of electricity is not fully understood. Life itself possibly is an electro-chemical reaction, brought about and maintained by the interchange of the intercellular fermentative activities. And the human body is a complicated electrical apparatus: the lungs are the battery and the nerves are the wires insulated with sheaths of medulated and lipoid coatings. If the nerve current propagates at the rate of 120 meters per second only, while electricity at 3000 miles, it is because the nerve is not a homogenous wire, but interrupted by thousands of sympathetic junctions. It is now recognised that the insignificant quantity of minerals in the diet plays a vital role in the economy. It is very likely that they are intimately connected with the generation of electric current. And like vibrations of light and sound waves, the human organism can only adjust within a limited range. Beyond that, it provokes death by molecular change in the nervous system as in electricution. The alternative current of 200 voltage kills a dog within 30 seconds, 700

a horse and about 2000 a human being. This also proves that the human body is a better electrical machinery, withstanding the shocks of 2000 voltage, while the horse though superior to man in body weight and muscular strength, succumbs to shocks of 700 voltage,

Infectious (daiva-vala) agents are of various kinds as a sporozoid in malaria (*plasmodium malaria*), a high fungus akin to streptothrix actinomyces in tuberculosis (*bacillus tuberculosis*) or a bacterium like gonococcus in gonorrhea. It seems that the pathogenic microbic agents are almost ubiquitous. They are in the soil, water and the air. They find themselves upon our skin from all sources. But they usually live there a harmless saprophytic life, as the horny epidermis underlined by a layer of fat offers resistance to their penetration. With each inspiration countless bacteria get admission in the respiratory passage, but they are retained by the hair in the nasal orifices and by the vibratile cilia of the mucous membrane. Those who penetrate farther, are either expelled with the mucous secretions, or by the germicidal mucus they are disinfected and pasted on the walls of the nasal orifices. The microorganism invade in large colonies the alimentary canal with the ingestion of food and drink,

but the hydrochloric acid content of the gastric juice possesses a considerable germicidal power. The intestine unquestionably is a favorable place for their growth, as sufficient humidity, warmth and nutrition from the residue of the food are found ideally combined, and there is hardly any antiseptic secretion there to arrest their development. In the gastric cavity are found nearly 50,000 microbes, in the mouth of duodenum 30,000, in the cecum 25,000 and in the lower intestine about 100,000 per cubic millimeter. On the whole, on the same basis of computation there are about 412,000,000,000 microbes in the whole of the alimentary canal and every day with the feces from 12 to 15 billions are evacuated. That they do not increase usually more than that, is due to the fact that the fermentative bacterial colony counteracts the luxuriant growth of the putrefying germs which cannot flourish in the acid medium and thus they preserve a mutual balance against each other so that they can not easily become obnoxious to the economy. But in case the vegetative microbial flora become active and virulent, they reach the lymphatic glands and the liver, where they are destroyed. Of course the toxins liberated by the pathogenic micro-organisms

can be absorbed, but they are more or less attenuated, modified and made innocuous in the hepatic cells and other mechanisms of the body. Though the vulva and vagina swarm with pathogenic germs, infection through the genito-urinary passages is very rare except in venereal diseases as gonorrhea, soft chancre and syphilis, where even an abrasion, wound or cut is necessary which generally takes place through the sexual congress by the sharp edges of the hair, so that the venereal disease-producing germs can find a safe lodging place to develop in vitality and virulence, as they are partly disinfected by the germicidal mucous secretion and washed away by the force of urination. When the morbid agents as streptococcus are introduced in the vaginal canal, they are all destroyed within forty-eight hours (*Menge*) by the abundant vaginal secretions.

But even when the pathogenic germs force through and invade the economy, the body is not defenceless. When their morbid action is not very virulent, the leucocytes rush up to the locality and destroy them; if complete destruction is not possible for the phagocytes, the lesion is circumscribed by the leucocytes and the exudation. However, if the morbid

invading micro-organisms are very virulent, then of course the leucocytes are repelled by the negative chemotoxic action of their secretory toxins. And then they invade the economy by the lymphatic or venous path. For blood has a considerable germicidal power due to its opsonic content. But even in case the microbes enter by way of the stomach or the intestine and reach the portal vein, they have to pass through the formidable fortresses of the bodily defensive mechanism—the liver and the lungs which exercise a tremendous germicidal action, before they can enter into the left heart to be thrown into the general circulation. And whether the microbes enter into the circulatory system by the portal vein or penetrating through the capillaries, any way in blood they have but short-lived existence, for either they are destroyed or driven into the capillaries, within less than ten to fifteen minutes.

Life is indeed a continuous struggle with the micro-organisms to preserve its integrity. Even when there is a general invasion, the body does not give up the task of self-preservation hopelessly. The body enjoys more or less various immunities—racial, ancestral, seasonal, inoculationary acquired and passive as a natural

reaction of the organism to counteract the toxic products of the disease germs. We know that the Negro races possess a remarkable immunity against *yellow fever* while they are very susceptible to tetanus and tuberculosis. The Mongolian race is very predisposed to small-pox, but not to tuberculosis. It is well known that the offsprings of a gouty family are almost immune against tuberculosis. And syphilis runs in Europe a benign form, which when introduced among savages, rages like an epidemic and exterminates the population. Seasonal preference for diseases is also well marked as the typhoid and the gastro-intestinal diseases in the summer, malaria in the autumn, thoracic disorders in the winter and pneumonia in the spring. It is the Chinese who first noticed about four thousand years ago that certain diseases like the small-pox gave an immunity to its victim against its recurrence. On this principle, vaccination has driven away small-pox practically from all civilized countries. As a prophylaxis against infectious diseases, *serum therapy* is being built up on the same basis, inoculating an animal with the virus and thus gradually attenuating the virus through a few successive animals, a serum can be obtained

which contains enough of antibodies, but not strong enough to cause any malaise, in the human system. The inoculation of the attenuated serum is not only a prophylaxis against the disease, but even when the infection takes place, it stimulates the resisting power of the organism by its bacteriolytic (*lysogenic*), agglutinative and opsonic action. Various sera have been made and tried as that of typhoid, pneumonia, cholera, but yet only the vaccine of small-pox has given completely satisfactory result. But undoubtedly with the improvement of technique and with better knowledge of bio-chemistry and bacteriology, modified bacterial sera promise great results in therapeutics in no distant future.

Incubation Period of the Infectious Diseases.

| Disease | Microbe | Average | Minimum | Maximum |
|----------------|----------------------------|------------|----------|----------------|
| Anthrax | Bacillus anthracis | 2 days | 1 day | 3 days |
| Cholera | Spirillum cholera Asiatic | 2 to 4 " | 1 " | 6 " |
| Diphtheria | Klebs-Loeffler bacillus | 2 " | 2 " | 15 " |
| Erysipelas | Streptococcus erysipelatos | 4 to 6 " | 7 hours | 22 " |
| Gonorrhoea | Gonococcus | 3 to 5 " | 1 to 2 " | 7 to 28 " |
| Influenza | Pfeiffer's bacillus | 3 to 4 " | 1 " | 5 " |
| Malaria | Plasmodium malariae | 6 to 10 " | 4 " | Several months |
| Measles | ... | 8 to 12 " | 4 " | 14 days |
| Plague | Bacillus pestis | 1 to 3 " | 8 hours | 10 " |
| Small-pox | ... | 12 " | 7 " | 15 " |
| Chicken Pox | ... | 15 " | 14 " | 17 " |
| Syphilis | Treponema pallidum | 20 to 30 " | 10 " | 50 " |
| Tetanus | Bacillus tetani | 2 to 3 " | 7 hours | 30 " |
| Typhoid | Bacillus typhosus | 14 " | 3 " | 21 " |
| Whooping cough | ... | 8 " | 2 " | 10 " |

All infectious diseases are now ascribed to microbic agents and they have been all identified except in some eruptive fevers as the scarlatina, measles, small-pox, varcella (*chicken pox*) and ere long, it is expected they will be isolated. The parasytic diseases can be classified this way.

Diseases due to pyogenetic micrococci:—Suppuration, septicemia, erysipelas and gonorrhea.

Acute diseases due to specific bacilli:—Cholera, diphtheria, influenza, meningitis, plague, pneumonia, tetanus, typhoid, yellow-fever.

Chronic diseases due to tissue bacilli:—Glanders, leprosy, tuberculosis, mycetoma (*Madura foot*).

Diseases due to protozoa:—Dysentery, filariasis, kala-azar, malaria, sleeping sickness, syphilis.

But the same morbid agent may cause local or general pathogenesis as for example, when pyogenic streptococcus is inoculated subcutaneously, only a local lesion—erysipelas is produced, but when it is injected into the veins, it causes general infection—septicemia.

The microbes (*krimi*) in the feces originate in the same way as those in the lymphatics. Their habitat is the intestine. If some of them (*krimi*) travel towards the stomach, then in the breath and in the vomiting, there is bad odor. They

are minute, globular (*micrococci*), white-complexioned, long (rod-like bacteria as that of the anthrax), and like the lamb-hair (*leptothrix*).” *Charaka* III. 7. 9⁵⁶.

Dental caries : “In this disease the microbes (*krimi*), originating from corrupt blood, blacken, perforate and loosen the teeth.” *Suśruta* II. 16, 27⁵⁷.

The disease-producing germs are introduced into the system either through the air as tuberculosis, food and drink as in cholera, through soil as in tetanus, personal contact as in gonorrhea, or through an intermediary as in malaria (*anopheles*). As long as the microbes remain in vegetative state, they simply live as parasites, but sparing the host and doing the least harm to the economy, as they take only the minimum food for their maintenance. It is only when the organism is devitalized due to over-work, fatigue,

56. पुरोषजाक्षुष्यसमृत्यानाः श्लेष्मजैः । तेषां पक्षाघात एव स्थानम् । प्रवर्धमानास्त्वधो ते विसर्पन्ति, यस्य पुनरामाशयोन्मुखाय स्युः, तदनन्तरं तस्योद्धारनिश्वासाः पुरोषगन्धिः स्युः । संस्थानवर्णविशेषास्तु सूक्ष्मवृक्षपर्यीणाद्याः श्वेता दीर्घाश्चांशुसङ्काशाः केचित् । श्वरकसंहिता, विमानस्थानम्, ७, ८ ।

57. कृच्छ्रान्दिदो बलः क्षापी ससंरम्भो महाबलः । अनिमित्तबुद्धौ याताविज्ञेयः कृमिदन्तकः ॥ सुश्रुतसंहिता, निदानस्थानम्, १६, २७ ।

malnutrition, or undernutrition that they become virulent and by their toxic secretion cause functional disturbances and reactions.

Flies deposit microbes in the ulcer and when the ulcer is eaten up by those microbes, (local) edema is produced. *Suśruta* IV. 1. 103⁵.

Chemical (biṣa) agents are many, but they can be divided into two classes as endogenous and exogenous. The endogenous toxins are those that are produced autogenously in the cells as metabolic wastes or engendered by the microbes that live on the body as parasites. The exogenous toxins may be introduced with rotten, poisonous, indigestive or disharmonious combination of food and drink, bites of venomous snakes and insects, occupations in lead, copper, corrosive chemicals, sulphur, arsenic, quick-silver mines or ovens, especially of coke-coals where in addition carbon monoxide may be absorbed

“Toxins are of two kinds : stable (*vegetable and metallic*) and mobile (of animal origin).

Stable toxins are divided into ten classes and the mobile toxins into sixteen classes. Root, leaf, fruit, flower, skin, exudation, juice, extract, 'dhātu' (chemical principle or metal) and bulb are the sources of *sthāvara* (stable) poisons." *Suśruta* V. 2. 2-3".

"Retention of feces and urine (through absorption of their poisonous contents), day-sleep, keeping vigil at night, drinking of liquor, exposure to cold and wind, sexual excess, exposure to foul odor, dust, smoke, wind and the sun, ingestion of (excessive quantity of) foods that are hard to digest, acid or vegetables (*śāka* = leaves of plants), drinking of very cold water, receiving a wound in the head, acidity due to indigestion, weeping, retention of tear, cloudy weather, extreme depression, some misfortune to the country and untimely season, derange the nerve, venous and lymphatic systems and vitiate the blood of the brain and

59.

स्यावरं जङ्गमश्चैव द्विविधं विवक्ष्यते ।

दशाधिष्ठानमाद्यन्तु द्वितीयं षोडशान्यथम् ॥

मूलं पत्रं फलं पुष्पं त्वक् चौरं सार एव च ।

निर्यासो धातवश्चैव कन्दश्च दशमः शृतः ॥३॥

सुश्रुतसंहिता, कल्पस्थान, २, २-३ ।

thus cause headache with varied symptoms.”
Charaka 1. 17. 4⁶⁰.

“Foods that are turned into poison by (disharmonious) combination, are being mentioned..... Do not eat meat or fish with the grains of sprouting rice, fat, honey, milk, molasses or with bean (*māṣa-paseolus radiatus*). Do not take clarified butter, if it has been kept more than ten days in a brass vessel.” *Suśruta* 1. 20. 12-13⁶¹.

60. सन्धारणाद्दिवस्त्रप्राद्रात्री जागरणान्मदात् ।
उज्जेर्भाष्यादवश्यायात् प्रागुतादतिर्मुनात् ॥
गन्धादसात्मप्रादाप्राताद्रजोधूमानिखातपात् ।
गुर्व्वस्त्रहरितादानादतिशीतान्मुसीवनात् ॥
शिरोभिघाताद् दामाद्रोदनाद्याप्यनियन्तात् ।
मिघागमान्मनसापाद्दृशकालविपर्ययात् ॥
वातादयः प्रकुप्यन्ति शिरस्त्र्यक्षश्च दुष्यति ।
ततः शिरसि जायन्ते रोगा विविधलक्षणाः ॥

चरकसंहिता, भूतस्थानम्, १७, ४ ।

61. अतोऽप्यान्वपि संधोगादङ्गितानि वक्ष्यामः । न च विदुर्धन्यैर्बसामधुपयो-
गुडमात्रैर्वा याम्यान्पौदकपिशितादीन्वध्यवहरेत् । न पयोमधुभ्यां रोहिणीशकं जातु-
शकं वात्रीयात् । बलाकां वारणीकुम्भाभाभ्याम्, काकमाचौं पिप्पलीमरिचाभ्यां,
नाकीभक्षाशककुलटपौत्रि च नैकथम् । मधु चोषोदकानुपानं पित्तं वा मांसानि ।
सुराकृशरापायसां च नैकथम् । खीवीरके च सङ्घ तिलशङ्कुर्जम् । मत्स्यैः सङ्घ-
विकारान् । गुडेन काकमाचौम् । मधुना मूलकम् । गुडेन वाराहं मधुना सङ्घ-
विह्वलम् । खीरे च मूलकम् । चावजान्मदनाविच्छृङ्खरगोधा च सर्प्यां च महत्स्यान्

“Poison is not the only toxin; unpurified copper (that has not been incinerated and calcinated) is a terrible poison.” *Rasendra-Sāra-saṃgraha* 1. 136⁶².

“Unpurified sulphur (that has not been incinerated and calcinated) produces fever, eczema, delirium and bilious disorders.” *Rasendra-sāra-saṃgraha* 1. 50⁶³.

Purified mercury (that has been incinerated and calcinated) is like real ambrosia, but faulty (i. e. incompletely purified or unpurified) is harmful like venom.” *Rasendra-sāra-saṃgraha* 1. 7⁶⁴.

विशेषेण चिलिचिमं पयसा । कदलीफलं तालफलेन पयसा दध्ना तन्नेष वा । लज्जुच-
फलं पयसा दध्ना भाषस्पृष्टेन वा मधुना घृतेन च, प्राक् पयसः पयसोऽन्ते वा ॥१२

अतः कर्षादिवृद्धान् वक्ष्यामः । कपोतान् सर्षपतैलभृष्टान् नाद्यात् । कपिल-
मयूरलावतिभिरिगोधाश्च रण्डदार्ढ्यप्रिसिद्धा एरण्डतेलसिद्धा वा नाद्यात् । कांस्यभागने
दशरात्रपतुर्पितं सर्पिः । मधु चोष्णं रुणो वा । मत्स्यपरिपचने शङ्खवेरपरिपचने वा
सिद्धा काकमाधोम् । तिलकल्कसिद्धमुपोदिकाशकम् । नारिकेलेन वराहवसा-
चरिभृष्टा बलाकाम् । भासमङ्गारयुग्मं नान्नीयादिति ॥

सुशुतसंहिता, सूत्रस्थानम्, २०, १२-१३ ।

62. न विषं विषमित्याहुस्मान्श्च विषमुच्यते । रसेन्द्रसारसंघट्ट, १, १३६ ।

63. अशुद्धगन्धः कुर्वते तु तापं कुष्ठं भ्रमं पित्तवृद्धां करोति ।

रसेन्द्रसारसंघट्ट, १, ५० ।

64. शङ्खोऽयममृतः साक्षात् दीपयुक्तो रसो विषम् ॥ रसेन्द्रसारसंघट्ट, १, ७ ।

Poisoning might also take place from the ingestion of some fish-eggs at the breeding season, some fish and molluscs which live on putrefied matter, from the cooking earthen vessels that are varnished with substances containing lead, arsenic or vermilion, foods that are colored and flavored with aniline products or preserved with an excessive dose of salicylic acid.

All the snakes are not poisonous however, for though they are provided with a venom gland, all of them do not possess an excretory duct, so that the venom can not be poured out.

But all poisons do not act immediately on the organism. Some poisons especially the metallic ones as arsenic, mercury, lead, sulphur have cumulative effect. Though they may be taken in small doses, they may be accumulated in the liver and the osseous system and after months or even years, they might express in violent reaction of their cumulated effect. But in other poisons as that of morphine, alcohol and tobacco, the harmful reaction ceases more or less after a while when the organism acquires the habit of neutralising the noxious substances of those poisonings. Tobacco not only harms the organism by the partial absorption of nicotine, but also by the inhalation of carbonic acid, carbonic oxide,

sulphuretted hydrogen, hydrocyanic acid and pyridic bases, which the tobacco smoking produces.

According to Charaka (III. 6. 4), the diseases are innumerable, but Suśruta (VI. 66. 6.) calculates them as eleven hundred.

IV. DISEASES AND THEIR DIAGNOSIS.

“The physician in order to make a prognosis, must examine by *direct* (*pratyakṣa*), *indirect* (*anumāna*=inference) and *differential diagnosis*, the *color* [of the skin : lemon yellow tint in pernicious anemia, waxy pallor in nephritis, bronzing in Addison’s disease, greenish hue in chlorosis, blue skin (*cyanosis*) in congenital heart disease, brownish-yellow coloration in jaundice, grayish tinge in the long-continued therapeutic ingestion of silver nitrate, yellow tint in cancer and a permanent pallor in malarial cachexia, tuberculosis, leucemia, syphilis, chronic mercurial, lead and arsenic poisoning], *voice* [whispering voice (*aphonia*), coarse or harsh quality of the voice that is generally known as ‘hoarseness’ (*dysphonia*) are due to the inflammation of the larynx, or disease, or pressure upon the recurrent laryngeal nerve; chronic aphonia (hysterical aphonia is only temporary) is said

to be prodromal of leprosy and chronic hoarseness that of cancer ; deep, hoarse voice and brassy cough indicate interference with the superior laryngeal nerve and if there is aphonia without cough or dysphonia, it may be due to paralysis of all the laryngeal muscles ; a flat and toneless voice results from one-sided paralysis of a cord and a falsetto voice from paresis of the tensors of the cords ; the open nasal tone is indicative of the paralysis of the soft palate or destruction of the soft palate by ulceration, usually syphilitic or of congenital cleft of the palate, and the closed nasal voice is often suggestive of coryza, hay asthma, hypertrophic rhinitis, nasal polypus, postnasal adenoids, enlarged faucial tonsils, suppurative tonsillitis, acute pharyngitis and retropharyngeal abscess ; the varied forms of aphasia, motor (*aphemia, agraphia*), sensory (*visual, auditory*), conduction, are the symptomatic expressions of the focal cerebral lesion, occurring in the left hemisphere in the right handed and the right hemisphere in the left-handed, but might also occur in cerebral hemorrhage, thrombosis, embolism, abscess, tumor, gumma, depressed fracture of the skull and more rarely in hysteria, neurasthenia and immediately after epileptic convulsion], *odor*

[an unpleasant odor of breath is usually present in the mouth of those whose teeth are not cleansed and food particles are allowed to accumulate on them and to cause decomposition and fermentation ; a foul odor in stomatitis and glossitis ; a stale and musty odor with the accumulation of sordes upon the teeth as in typhoid ; caries of the teeth, necrosis of the jaw, pharyngeal or tonsillar diphtheria, follicular tonsilitis and locunar concretions also produce bad odor ; but the most fetid odor attends the mercurial and gangrenous stomatitis and less so scurvy ; in uridrosis occurring with diseases in which the action of the kidney has been impaired, the sweat has a urinous odor, and deposits white scales or crystals of urinary solids upon the skin ; there is volatile fatty emanation from the sebaceous secretion and mixed with perspiration, the odor varies in health and sickness, according to age and race : among the Negroes, it is the most pronounced and in the Mongolian race, it is the least], *taste* [a bitter taste is felt in jaundice ; a coppery taste in gastro-duodenal catarrh (biliousness) ; diversified taste sensations as sweetish, sour, foul are felt when the tongue is coated and furred from whatever cause ;

abnormal taste with the long continued use of certain drugs as potassium bromide, iodide or tartar emetic ; perversions of taste in hysteria ; absence of taste (*ageusia*), if it is unilateral is indicative of the disease of the glosso-pharyngeal nerve, and if it is bilateral, of the diseases of the nose as coryza or polypus ; partial impairment of taste (*hemiageusia*) may be due to the facial paralysis, or due to local conditions of the mucous membrane of the tongue, involving the taste buds and end-organs of the gustatory fibers, as in thickly furred or coated tongue, or due to the irritating(as of piperine)or blunting(as of bromides) action of the drugs or condiments), *touch (sparsa)* comprises tactile sense (*esthesis*), pain sense (*algia*), temperature sense (*thermoesthesia*), muscle sense (*myesthesia*) : the loss of tactile sensibility (*anesthesia*) is indicative of cerebral lesions (*causing hemiplegia*), hysteria, traumatic neuroses, diseases of the spinal cord, especially locomotor ataxia, neuritis and leprosy ; hemianesthesia, the loss of sensibility confined to one side of the body or to lower extremities or of unequal distribution, are mainly due to hysteria ; an excessive sensibility (*hyperesthesia*) is generally met with in hysteria, chiefly in the hysterogenic zones, which are in the breasts and below

them in the central part of the chest, in the pelvic region and the back ; in neurasthenia there are localized hypersensitive tender spots along the spine, scalp and the chest ; in menopause and gouty diathesis, there are also tender points on the scalp ; a general hypersensitiveness may be present in influenza, typhoid fever, and in alcoholic intoxication , disturbances in the heat and cold sensation (*thermaesthesia*) are due to syringomyelia and to a less extent to the lesions of the medulla and locomotor ataxia ; disturbances of the pain sensation—either hyper— or hypo-sensibility are due to syringomyelia, Morvan's disease, hysteria and syphilitic chord disease ; loss of muscular sensation is characteristic in locomotor ataxia, paramyoclonus multiplex, myeletic disease, and the lesions in the medulla and the pons ; transference of sensation (*allochiria*) so that a touch, on one side of the body is felt on the other, is symptomatic of hysteria, locomotor ataxia, disseminated sclerosis, myeletis; delayed conduction so that a tactile or pain sensation requires 5 seconds or more, instead of one-tenth of a second, is characteristic of locomotor ataxia and peripheral paresis), the *eye* (edema of the eye-lid, particularly the lower one, is usually symptomatic of renal disease ; morning

puffiness with bloated face is also seen after a night of debauchery or in cases of profound anemia, chlorosis or in neurotic adolescents ; in erysipelas, glanders, severe coryza, hay fever, measles, variola and occasionally in varcella, as well as the prolonged use of arsenic and iodine may induce the swelling of the eye-lids ; ptosis—the dropping of the eye-lid—is either congenital or due to the paralysis of the third nerve ; lagophthalmos—imperfect closure of the lids follows paralysis of the orbicularis muscle, either due to lesions of the portio dura of the facial nerve or leprosy ; blepharospasm—spasmodic closure of the lids is due to the reflex excitability of the fifth nerve in photophobia, in ocular disorders and is symptomatic of meningitis, cerebral tumors, typhus, measles in certain stages of their evolution and may be also present without actual inflammation of the membrane in hysteria and in chorea in children ; hordeolum—a sty or minute boil on the palpebral margin, if small and single may be of local origin or indicative of the over-use of defective eyes or more frequently of digestive or genital disorders ; blepharitis—inflammation of the margin of the lids which become thick, reddened and crusted with cheesy secretions, is indicative of scrofula or

of minute ulceration, resulting from a previous ophthalmia or measles, anemia or in tuberculous diathesis ; verruca—warts upon the eye-lids, are usually found in the old people, indicating the possibility of commencing epithelioma ; syphilitic ulceration is generally deeply indurated and accompanies other stigmata of the tertiary stage ; a dusky color of the lids and under the eyes is seen in women during menstruation, in menorrhagia, long-continued leucorrhea and early in pregnancy : it may also accompany anemia, loss of sleep and in exhausting diseases ; dark circles round the eyes are symptomatic of the abuses of masturbation ; the yellow color of the sclera of the eye is symptomatic of jaundice ; bluish-white or pearly sclerotic is seen in anemia, pthisis and nephritis ; inflamed conjunctiva is usually caused by gonorrheal infection, though it may be present in lesser degree in diphtheria, measles, hay fever, coryza and influenza of the catarrhal type ; the eye may be dry and glazed in collapse or the typhoid status ; an increased secretion of the watery fluid of the eye (*lachrymation*) accompanies conjunctivitis, irritation of any kind and in alcoholism : inflammation of the cornea (*keratitis*) is mainly of syphilitic origin, while the ulceration of the cornea—a reddened,

painful, photophobic eye may be in relation with exophthalmic goitre; protrusion of the eye-ball (*exophthalmos*) is symptomatic of exophthalmic goitre and may be also present in lesser degree in spasmodic asthma or other conditions attended by dyspnoea; recession of the eye-ball or the sinking of the eye-ball into the orbit (*enophthalmos*) may be provoked by any wasting disease as consumption, malaria, cancerous cachexia, by absorbing the cushion of fat of the orbital cavity; dimness of vision may be provoked by uremia, diabetes, excessive abuse of tobacco, hysteria and migraine; light appears yellowish in jaundice, and reddish after nervous irritation, fatigue and in wasting diseases), ear (unusually prominent, long or misplaced ears with absence of helix, antihelix, or lobule, are degenerative stigmata; tophi—small, hard, gritty accretions of chalky masses of sodium urate, seen as nodules in the external ear along the margin or in the depressions, is of gouty diathesis; a very thin, waxy and bluish ear may indicate general anemia or chlorosis; but a thickened and a deformed ear with the effusion of blood between the cartilages and the perichondrium (*hematoma auris*), is a trophoneurosis of the general

paralytic and the insane; the flow of pus (*otorrhea*) from the meatus, which is very common among children and often associated with intense pain, due to inflammation of the tympanum (*otitis media*), caused by tonsillitis, influenza or measles, is usually without serious consequences, deafness is indicative of the disease of the tympanum, eustacian tube or the auditory nerve: it can be easily found out by placing a watch at a varying distance from the ear and if its ticking sound is not audible by aerial conduction, and then if the same watch is placed upon the mastoid process and the sound becomes audible by bone conduction, then it clearly indicates that there is no nervous lesion and the deafness is due to local hindrances: the auditory nerve and its cortical center may be affected by syphilis, which is usually the case or by tuberculosis by injuring the nerve endings: quinine, salicylic acid or the salicylates may also provoke temporary deafness by causing labyrinthine hyperemia; hypersensitiveness of hearing (*oxyacoia*) and the buzzing, roaring, hissing sound (*tinnitus aurium*), are due either to nervous irritability or to rhinopharyngeal catarrh, with involvement of the eustacian tube or the middle ear), nose [a coarse

and broad nose is symptomatic of myxedema and cretinism ; a depressed and sunken nose is syphilitic unless there is traumatic fracture of the bone ; a pinched and distorted nose may be due to obstruction of polypus, tumor or adenoid growth ; a chronic redness of the nose with dilated capillaries is indicative of alcoholism, otherwise of chronic digestive disorders or aurenorrhœa ; an intense pain in the nose is symptomatic of syphilitic lesion and a burning pain, to catarrhal inflammations ; a sensation of dryness is felt in the preliminary stages of coryza ; sneezing—the spasmodic expiration, is due to the direct (presence of any foreign body or the inhalation of irritant substances as pepper, snuff and in the early stage of coryza, measles, pertussis, hay fever, asthma) or reflex (as in hysteria) irritation of the sensory nerves of the nose ; nasal stenosis—difficulty of breathing through the nose, if acute, is symptomatic of an acute coryza, diphtheria, hay fever or prodromal of typhus fever, glanders and variola, and if chronic, it is either due to the obstruction to lymphoid growths as in children or to congenital syphilis ; ulceration of the mucous membrane is usually a manifestation of tertiary syphilis or tuberculosis and might be followed

by necrosis and caries of the bones : the ulcerated surfaces of syphilitic origin is covered with a dry, greenish crust and the stench of the breath is sickening ; non-offensive, watery discharge from the nose marks the beginning of acute coryza, hay fever, pertussis, measles, typhus fever, catarrhal form of influenza and iodism ; offensive discharge accompanied with greenish-gray crusts and its foul odor imperceptible to the subject, is symptomatic of syphilitic necrosis or of atrophic rhinitis ; a discharge of blood from the nose (*epistaxis*) may have varied causes as alcoholism which renders the vessels to rupture, adenoid growths, ulceration in the nose, suppressed menstruation, chronic nephritis, cerebral thrombosis, and may be prodromal of typhoid or other eruptive fever infection ; loss of sense of smell (*anosmia*) may be due to local obstruction as polipi or adenoid growths, or chronic rhinitis and if it be only temporary, it may be of neurotic origin as hysteria or neurasthenia, and if it be permanent, the olfactory anesthesia may be caused by nasal necrosis of the bone, supporting the tract, or a tumor involving the nerve ; hypersensitiveness to smell (*hyperosmia*), hallucinary smell (*parosmia*) and an offensive smell (*kakosmia*)

without any physical basis, are all of neurotic origin], *tongue* [the colour of the tongue, the only mucous membrane of the body, except the oral and the faucial, that is open to naked eye inspection, changes according to health, digestion and especially to the gastric condition to which it is closely related : it is pallid in anemia, bluish in cyanosis, reddish in gastric hyper-acidity, bright-red in the first stage of scarlet fever and in the inflammation of the tongue (*glossitis*), and greyish in nigrities ; a great enlargement of the tongue takes place in acromegaly and myxedema, but the tongue also swells considerably in variola, salivary calculus and in angina Ludovici ; the coating of the tongue consists of the accumulated epithelium, micro-organisms and food detritus : a thin-white coated tongue may be normal among the smokers or those who are accustomed to breathe through the mouth, but it usually accompanies mild gastro-intestinal disorder, nasopharyngeal catarrh or light fevers ; a flabby, swollen, indented tongue, covered with a yellow, pasty fur, is symptomatic of catarrhal gastritis, gastro-duodenitis or febrile conditions ; a narrow tongue with a deep median fissure on each side of which there is a rough, thick, brownish fur, or if it be

dry, red and glazed, is characteristic in typhoid status in its early and late stages ; a covered tongue with white fur through which project swollen and bright-red fungiform papilla, is indicative of measles and other eruptive fevers ; if one side of the tongue is higher than the other, this is due to the unilateral lingual paralysis and associated with hemiplegia ; if the tongue lies motionless in the floor of the mouth and the subject is unable to protrude it and the functions of speech, mastication and deglutition are seriously impaired, it is due to the total lingual paralysis, caused by thrombosis or syphilic lesion], *skin* [dryness of the skin (*anidrosis*) is observed in cholera, myxedema, diabetes, Bright's disease, dropsy and in the first stage of many acute diseases, attended by high fever ; moist skin and increased perspiration (*hyperidrosis*) occurs in typhoid fever, tuberculosis, trichinosis, tetanus and in rheumatism, but the rheumatic sweat is strong in odor and acid in reaction ; in many acute diseases '*critical sweats*' suddenly break out with the fall of temperature as in pneumonia with the termination of paroxysm as in malaria, or the night sweats of tuberculosis and other wasting diseases ; partial or localized sweating is caused by the deranged innervation of the

vaso-motor nerves and by the local vaso-motor paresis : this is particularly marked in rhachitis and in which disease, which usually occurs among children, the sweat is confined to the head and the patient rolls his head at night and the hair on the back of the head is rubbed off ; sweating of the hands and feet are seen in general debility ; unilateral or one-sided sweating of the head and face may arise from destructive pressure on the sympathetic nerves, causing paralysis of the dilator fibers of the ciliospinal branches, as in thoracic aneurism, suppurative parotitis, migraine, neuralgia ; unilateral sweating of the body (*hemodrosis*) occurs in hemoplegia : ecchymosis and petechiae—purple patches caused by extravasation of blood into the skin, appear in many diseases and drug poisonings as in acute yellow atrophy of the liver, pernicious anemia, in advanced stage of cancer of the liver and the stomach, cerebro-spinal meningitis (epidemic), cyanosis, diphtheria, jaundice (in severe forms), old age (in the extremities), peliosis rheumatica, pyemia, advanced cirrhosis (hepatic or renal), septicæmia, tuberculosis (with extreme debility), typhoid fevers, ulcerative (malignant) endocarditis, yellow fever, and the rashes may be caused either by idiosyn-

crasy or by poisoning with antipyrine, arnica, arsenic, atropine, belladonna, cannabis indica, capsicum, chloral, copper, croton oil, digitalis, iodine, ergot, lead, mercury, morphine, opium, potassium iodide and bromide, quinine, salicylates, santonine, silver, sulphur, tar, tartar emetic ; inflammatory eruption in cerebro-spinal fever, dengue, glanders (acute), erysipelas, syphilis ; exanthematous eruption in measles, rubella, scarlatina, varicella, variola], *mind* (dullness of mind is seen in cerebral inflammations, sclerosis of the brain, and in brain tumors), *concentration of mind*, *purity* (hygienic conditions), *disposition*, *behavior*, *memory* [memory is impaired (*amnesia*) in paralytic dementia, epilepsy, neurasthenia, the over-use of bromides and in old age], *shape and general configuration of the body* (*ākṛti*--tall, thin subjects with slender ribs, and a long narrow thorax are predisposed to tuberculosis of the lungs ; short, stout, thick-boned persons with florid face are predisposed with sumptuous living to obesity and gouty diathesis), *temperament* (irritability of temper is often associated with gout, rheumatism, jaundice and neurasthenia ; change of temper is seen in pregnancy, typhoid fever, menopause and at the early stage of the exophthalmic goitre ; melan-

choly mood is marked in hepatic lesions), *perversions* (abnormalities of shape result from the following diseases as rachitis, acromegaly, myxedema, pulmonary osteo-arthritis, osteitis deformans, osteomalacia), *strength, endurance, intelligence, cheerfulness*, leanness (as in consumption), *obesity, lassitude, beginning of the disease, acuteness* (of the disease), *lightness* (of the disease) *physical characteristics, dietary, habits, quantity of food* (that is consumed), *the prevention of the disease* (prophylaxis), *the cure of the disease, the preliminary symptoms of the disease, pain* (pain is caused by the lesion of the peripheral, or the central nervous system, or indirectly by affecting the general economy; '*acute pain*' is characteristic of acute inflammations of the serous and synovial membranes as in pleurisy or in joint inflammations; '*dull pain*' is characteristic of the inflammation of the mucous membranes and the parenchymatous viscera; '*paroxysmal*' or *remitting pain*' is characteristic of neuralgias and colics; '*shifting pain*' is characteristic of rheumatism, hysteria, locomotor ataxia, trichinosis; '*gnawing or boring pain*' is characteristic in the diseases of the spinal column, thoracic and abdominal aneurism, periosteal inflammations, gastric carcinoma, and occasionally in gouty and lithemic

lesions; '*cramp*'—the sudden painful spasm of certain muscles, aside from the occupation cramps from the over-use of fingers as in writer's cramp, whether it is of the calf, toes or the abdomen is usually characteristic of gastro-intestinal diseases and flatulence by causing an excessive tension to the muscular wall of the stomach and the intestine; diffuse pain as in fever; pain in the vertex—the crown of the head, is characteristic in neurasthenia, diseases of ovaries, uterus, bladder, epilepsy, hysteria, anemia, chlorosis in the frontal and the temporal region of the head, in nephritis, uremia, eye strain, iritis, glaucoma, dyspepsia, constipation, syphilitic nodes, lithemia, rheumatism of the scalp; in the occipetal and cervical region: spinal irritation, diseases of the cervical vertebrae, dyspepsia, constipation, syphilis (very frequent), uterine lesions, eye strain, carious teeth, nephritis, uremia, cerebellar tumor, meningitis, adenoids of pharynx, naso-pharyngeal diseases, middle ear diseases, rheumatism; in the parietal region: dysmenorrhea, diseases of ear and bone, cancer of tongue, hysteria, lithemia; in the eye-balls: ophthalmoplegia interna inflammation of conjunctiva, iris, cornea, coryza, neuralgia of the fifth nerve, asthenopia (eye strain); in the nose: acute rhinitis

diphtheria, glanders, primary syphilis ; aural region : otitis media, furuncle of meatus, mastoid abscess, polypus, carious teeth, alveolar abscess, cancer of tongue, aneurism of innominate dentition, temporo-maxillary rheumatism, syphilitic or carious lesion of maxillary or temporal bones ; in the front neck : myalgia, cervical caries or abscess, sprains, inflamed lymph glands, aneurism of innominate ; nape of neck : rheumatism, neurasthenia, laryngitis, cerebrospinal meningitis, tetanus, cervico-occipital neuralgia ; throat : tonsillitis, pharyngitis, scarlatina, diphtheria, carcinoma, laryngitis, irritant poisoning ; jaw : dental affections, salivary calculus, neuralgia of maxillary-nerve, parotitis, actinomycosis ; shoulder : rheumatism, synovitis, diaphragmatic pleurisy, dilated stomach or colon, duodenitis, colitis, neuritis, gallstone colic, hepatic diseases ; sternum : gastric diseases, bronchitis, epidemic influenza, tabes, spinal apoplexy, angina pectoris, mediastinal abscess or tumor ; breast : uterine and ovarian lesions, hysteria, menstruation and diseases of mamma ; umbilicus : gallstone, hernia, carcinoma of omentum, tumor or ulcer of stomach ; chest : pleurisy, acute pneumonia, pericarditis, phthisis, mediastinal tumor ; hysteria ; flatulence, pericarditis ; right hypocondrium gall-stones (particularly)

hepatic diseases; carcinoma of stomach, pancreas or duodenum; movable kidney, uremia, pleurisy; left hypochondrium; gastritis, colitis, uremia, peritonitis, enlarged spleen; precordia: functional disorders of heart, endocarditis, thrombosis of pulmonar artery, gout, hysteria, locomotor ataxia, angina pectoris, pyrosis; Interscapular: flatulence, gastric inflammation or ulcer, rheumatism; lumbar: lumbago, fatigue, flatulence, appendicitis, hernia, dysmenorrhea, kidney lesions, prostatitis; epigastrium: gastric lesions, appendicitis, gallstones, ulcer of duodenum, carcinoma of pancreas, cholera asiatica; uremia, hepato-optosis, enteroptosis; abdomen: gastralgia, especially hyper-acidity, arsenical, mercurial or lead poisoning, peritonitis, hernia, intestinal tuberculosis, flatulence, tabes, pancreatic lesions, leucemia, dysmenorrhea, diabetes; right iliac: appendicitis, ovaritis, impacted cecum, colitis hernia, varicocele; left iliac: colitis, impacted sigmoid, hernia, ovaritis, varicocele; pubic region: cystitis, uterine or ovarian lesions, ectopic pregnancy, pyelitis, carcinoma of the bladder; sacral region: uterine, ovarian, or testicular lesions, excessive venery, ulcer of rectum, sciatica; spine: hysteria, neurasthenia, carcinoma of the liver,

rachitis, scurvy, febrile affectations, spinal curvature, mediastinal tumor; anterior thigh: ovarian or uterine diseases, pregnancy or displaced uterus, dysmenorrhea, renal colic, impacted feces; posterior thigh: sciatica, locomotor ataxia, impacted feces; leg: rheumatism, periostitis, leucemia, locomotor ataxia, spinal meningitis; calf: cramp due to nephritis, gout, diabetes, hysteria and over exertion; heel: gout, neurasthenia, ovarian lesion, achilodinia; sole of foot: plantar neuralgia, disease of prostrate, erythromelalgia,; in the articular joints: rheumatism, gonorrheal arthritis, synovitis, syphilis, tuberculosis, scurvy, neuralgia, pyemia, rachitis; testicle: orchitis, or epididymitis; penis and perinium: vesical calculus, or the passage of the uric acid crystals (gravel), inflammation or ulceration of the bladder, or irritation of the calculus in the ureter or urethra; diffuse pain in the extremities: multiple neuritis, muscular rheumatism, spinal meningitis, influenza, rachitis, trichinosis), *complaints*, *gracefulness* (of the body), *complexion* (a dull, muddy complexion in hepatic lesion, constipation and digestive troubles), *dreams* (dream as a diagnostic aid has not yet been thoroughly evaluated, as the phenomenon of dream is complex and it is hard to analyze it,

but it is well known that nightmares are usually caused by indigestion, and it is probable that the dream images are formed by the digestive activity, action of the heart and the peripheral impressions or the indirect pressure of the full bladder or impacted feces during sleep, reacting on the central nervous system, awaking the memory centers which for lack of co-ordination, become distorted and fragmentary), *messenger's countenance, disturbances on the road, the conditions of the sick-room, medicines, the reactions of the medicines* (upon the patient), and *advice about the medical prescriptions.*" Charaka V. I. 1st.

Predispositions (to diseases) are of six kinds : *racial*, (Negroes are predisposed to tuberculosis, the Mongolian race to small-pox, Whites to yellow-fever, Jews to diabetes and insanity), *ancestral* (congenital syphilis, arthritic diathesis), *geo-*

65. इह खलु वर्णस्य स्वस्य गन्धस्य स्पर्शस्य चक्षुष्यं श्रोत्रस्य घ्राणस्य रसनस्य स्पर्शनस्य सस्पर्शस्य भक्तिश्च शीतस्य शीलसाधारस्य क्षुतिशक्तितश्च प्रकृतितश्च विकृतितश्च बलस्य श्लान्तितश्च भेदा च हृष्यश्च रौचश्च क्षेद्यश्च तन्ना चारम्यश्च गौरवश्च लाघवश्च गुणसाधारस्य विहारासाधारपरिणामसोपायसापायस्य व्याधिश्च व्याधिपूर्वकपक्षे वेदनाद्युपद्रवाश्च ह्याया च प्रतिष्ठाया च स्वप्रदर्शनस्य दूताधिकारश्च पक्षि चैतत्पातिकात्मानुरक्तुषी भावावस्थानराशिश्च भेषजस्य भेषजप्रकृतितश्च भेषजाधिकारयुक्तिश्चेति परीक्ष्याणि प्रत्यक्षानुमानोपदेशैरायुषः प्रज्ञांवावर्धयेत् विशासमानेन भेषजा । अरकसंहिता, इन्द्रियस्थानम्, १, ॥

graphical (malaria localized in marshy places, where anopheles—a genus of mosquitos—an intermediary of its infection can grow and thrive), *periodical* (epidemics—pneumonia is usually prevalent in the spring, influenza in the winter), *according to age* (there are particular diseases of infancy, youth, middle-age and old-age) and *individual* (idiosyncrasy as susceptibility of certain persons to milk, oysters, strawberries etc, producing eczema, diarrhoea etc.) *Charaka* V. I. 3^o.

“So the *respiration* (the respiration rate of the newborn is 44; at five years, 26; in the adult, 16 to 20; in health it is faster standing than lying, during the day than at night, after meals than when fasting, in spring than in autumn, and during exercise, emotional and mental excitement than when at rest; and there is about four pulse beats for one respiration; rapid respiration is observed in pulmonary lesions, in lobar pneumonia and also in fever, especially in children by the indirect influence of the heated blood on the medulla; slow respiration is observed in coma, collapse and poisoning with

66. तत्र प्रकृतिर्जातिप्रसक्ता कुलप्रसक्ता च देशानुपातिनी च काष्ठानुपातिनी च
वृक्षानुपातिनी च प्रत्यात्मनियता चेति । अरक्वस'हिता, इन्द्रियस्थानम् १, २ ॥

opium, chloral, chloroform or antimony ; jerking inspiration is indicative of asthma, hysteria, hydrophobia ; jerking expiration in acute pleurisy and fractured rib ; stertorous respiration (snoring) is observed in apoplectic, uremic, diabetic coma, narcotic poisoning and paralysis of the soft palate, aside it is also observed in otherwise healthy individuals, especially children who have adenoids or enlarged tonsils and in grown-ups who are very tired and consequently there is muscular relaxation or are accustomed to mouth breathing, for the snoring sound arises from the vibration from the soft palate when breathing from the mouth and the nose at the same time ; stridulous or harsh respiration is due to some obstruction of the air passage through the larynx, caused through tumor, inflammation or any foreign body ; wavy or uneven respiration is symptomatic of pneumonia) ; *neck* (a long, scrawny neck with projecting larynx is indicative of tuberculous diathesis and is usually correlated with the pthisinoid chest, while a short and thick neck with apoplectic predisposition ; rigidity of the neck, if chronic, may arise from the lesion of the, cervical vertebrae, caused by syphilitic necrosis, arthritis or the affectation of the cervical muscles by rheumatism and if acute, through the inflam-

mations of cervical glands, tumors or boils interfering with movements of the neck ; nodes upon the clavical bones, resembling the callus, but not caused by trauma, indicate tertiary syphilitic lesion ; but tumefaction above the clavicles occur in amphysema and myxedema ; temporary swelling of the thyroid takes place during menstruation, or after sexual union, especially in women after first connubial embrace ; but a chronic enlargement is generally symptomatic of exophthalmic goitre, but may be also due to adenoma, cancer, tuberculosis or gumma of the gland : an atrophied and depressed thyroid is observed in myxedema and cretinism ; tenderness of the neck may be caused by the inflammation of the lymphatic glands of the region from any cause as cervico-occipital neuralgia, cervical myalgia or cervical caries), *teeth* (a baby should have six teeth when one year old, twelve when a year and half old, sixteen when two years old, twenty when two and half years old ; milk teeth : 2 lower central incisors appear between six to nine months ; 4 upper incisors between eight to twelve months ; 2 lower lateral incisors and 4 anterior molars between twelve to fifteen months ; 4 canines between eighteen to twenty-four months ; four

posterior molars between twenty-four to thirty months ; permanent teeth : 6 first molars appear between six and seven years ; 8 incisors between eight to nine years ; 8 bicuspids (*premolars*) between 9 to 11 years ; 4 canines between 11 to 14 years ; 2 second molars between 12 to 15 years ; 4 third molars between 17 to 25 years ; premature eruption of teeth is indicative of congenital syphilis or tubercular diathesis while delayed dentition that of rachitis or cretinism ; if the permanent upper central incisors are dwarfed, narrowed, short, peg-like or somewhat rounded, tapering from gum to edge, with a single, shallow and discolored notch in the edge, it is a sure sign of congenital syphilis, especially if it be associated with keratitis and middle-ear disease ; dentated or furrowed teeth originate from malnutrition or an acute illness during infancy, sufficiently severe to interfere with the nutrition ; loosening of the teeth in their sockets is associated with the ulcerated, spongy or bleeding gums and therefore it can be ascribed to mercurial or gangrenous stomatitis, pyorrhea alveolaris, scurvy or phosphorus poisoning ; a collection of sticky, dark-brown paste (*sordes*) upon the teeth, gums and the lips, sometimes stained with blood

oozing from the gums, is very often present in typhoid and other low fevers; gritting or grinding of the teeth among the children is usually associated with gastro-intestinal disorders; erosion of the teeth takes place in gouty subjects, with loss of polish of the labial surface, followed by grooves which extend into the gums, causing inflammation, necrosis, formation of calculi (*tartar*), loosening of the teeth and pyorrhea alveolaris; early, excessive or rapid dental caries may be due to rachitis, but also takes place in pregnancy, diabetes or chronic phosphorus poisoning; dyspepsia, chronic gastritis, constipation, diarrhoea, persistent aural, nasal, ophthalmic affections, nervous irritability, neuralgias or migraines may be easily caused by the carious teeth or pus sockets by the absorption of the toxin and the ingestion of microbes with the mastication of food), *liver* and the *spleen* (*pakṣa* = sides : the liver is the largest gland of the body and lies beneath the diaphragm in the right hypocondrium and the upper part of the epigastrium, about the size of 3 by 5 inches and weighing between two and half to three and half pounds; enlargement of the liver which can be felt through palpation, occur in chronic malaria, hypertrophic cirrhosis, leucemia, hydatids, fatty

infiltration, abscess, tumor, gummata or cancer; progressive lessening (*atrophy*) of the liver takes place in cirrhosis; displacement of the liver upward may be due to pressure from below by large abdominal tumors, meteorism or ascites, and by downward pressure on the diaphragm by emphysema, spasmodic asthma, large right pleural effusion, large intrathoracic tumor, a dilated heart or a pericardial effusion; abnormal rough, hard and resistant surface is indicative of cirrhosis, carcinoma, amyloid or syphilitic lesion: the *spleen* is of oval, flattened shape and lies in the left hypocondriac region between the stomach and the diaphragm, of almost the same size as the liver; the rapid enlargement of the spleen takes place in any acute infection, as in typhoid, malaria and other fevers, tuberculosis, small pox, diphtheria, pneumonia, cerebro-spinal meningitis, puemia or general septicemia; chronic enlargement of the spleen occurs in pernicious malaria, in splenic anemia, hepatic cirrhosis), *eyes*, *hairs*, [*keśa*=long hairs as of the head and the beard; *loma*=small and fine hairs of the other parts of the body: the hair is luxuriant, bright, oily and wavy in hypersecretion of thyroid as in Grave's, Basedow's diseases and the hair is dry, coarse, stiff and

sparse in hypo-secretion of the thyroid as in myxedema, cretinism; early gray hair before forty is usually associated with the premature arterial degeneration (*enderteritis*) but it is said that the sudden loss of pigmentation of the hair may take place at times under the influence of terrible fright, anxiety or deep emotion; tendency to premature grayness of the hair may be hereditary; circumscribed grey patches of hair may be due to trophic changes brought about by the lesion of the fifth nerve and its branches; undue and rapid loss of hair (*alopecia*) is indicative of syphilitic lesion, but this must not be confounded with the excessive falling out of hair which takes place during convalescence from acute diseases, as typhoid, malaria, nor with that following an attack of gout or erysipelas, for in syphilis the hair can be easily pulled in large masses without causing pain and the hair does not usually reappear; in anemia, phthisis pulmonalis, myxedema, hydrocephalis, and the severe neuralgias of the fifth nerve, the hair is usually thinned; premature loss of hair may be a hereditary family trait], *abdomen* [by inspection, palpation, percussion and auscultation, abdomen can be utilized of a great diagnostic

value : smooth, shining and stretched skin (in the abdomen) is observed in abdominal distension ; whitish stricks or striae are indicative of previous long-continued distension as in ascites, fat or pregnancy, and in extreme case, the whitish stricks (*lineae albicantes*) may be observed also on the buttocks and the upper portions of the thigh ; copper-colored, scaly, somewhat circular spots upon the abdomen are indicative of secondary syphilis, as well as the brownish or yellowish macular areas of cloasma, which may be also present ; enlarged glands in the groins signify either venereal infection or bubonic plague and their retracted cicatrices of their past lesions ; enlarged superficial abdominal veins, radiating from the umbilicus, appear in portal obstruction, through hepatic cirrhosis or tumor, ascites of long duration or greatly dilated stomach ; the navel (*umbilicus*) is deeply retracted in stout people ; if projecting it may be due to portal obstruction, pregnancy or hernia ; it is flattened or protruding in excessive ascites, or abdominal distentions ; fixation of the umbilicus is significant of hepatic malignant cancer ; the abdominal wall may be thick from the deposit of fat or edema and if it be thin with shrivelled skin, it may be due either to old age, wasting disease,

repeated pregnancies or as a reaction of long-standing distension from ascites ; the abdomen may be distended by the accumulation of fat in the abdominal wall, or fluid in the perital cavity or gas in the alimentary canal or the presence of a large tumor ; swelling in the gastric area may be due to tumor, abscess or cancer on the gastric wall, hepatic cancer or pancreatic cyst or sclerosis or the distension of the gall-bladder either with concretions or pus ; swelling in the hepatic area may be due to tumor, cancer, hypertrophic cirrhosis, hydatid cyst or passive congestion of the liver or sympathetically from the distended gall-bladder stuffed with concretions and pus ; swelling in the splenic area may be due to movable or prolapsed spleen, perinephritic abscess, or congested movable kidney, or cancer of the stomach ; the swelling of the appendical area is symptomatic of acute appendicitis ; swelling in the pelvic area may be due to distended bladder, or by the distended uterus by tumor or detained menstrual fluid (*imperforate hymen*) ; swelling in the sigmoid area may be due to the impaction of feces, tuberculous or cancerous peritonitis, ulcer of colon, ovarian tumor or cyst of broad ligament], *nails* (curving of the nails with clubbed fingers, occur only in chronic diseases as phthisis

emphysema, aneurism or chronic cardiac diseases; malformation, fragility, dryness or cracking of the nails may be due to injury, syphilis or due to trophic defects, resulting from nerve lesion, neuritis, syringomyelia or pulmonary osteo-arthopathy; arrested growth of nails may be due to hemiplegia from cerebral apoplexy or acute infantile paralysis; enlargement of the nails with thickening and sometimes twisting occurs in the course of syphilis, sclerodactyly and typhoid fevers; the nails in some cases of Raynaud's disease, become dry, scaly and cracked or hypertrophied; ecchymoses and ulcers at the bases of the nails may be due to chloral habit, but in a child (*onychias*) to syphilis or scrofulous diathesis; white marks or transverse grooves on the surface of the nails may indicate, unless due to injury, the period of recovery from a recent acute illness; the growth of the nail from the matrix to the end requires about six months and as the white marks develop at the root of the nail and with the growth of the nail, the transverse grooves also ascend higher and so a rough estimate can be made from their position of the time that has elapsed since the convalescence set in; hard, brittle, and longitudinally striated

nails are observed in gouty subjects), *finger* (distorted fingers are due to gout, arthritis deformans and less frequently to chronic rheumatism; hard, white, glissening masses (*tophi*) may be present in the joints or along the tendons, on account of the accumulation of the sodium urate in gout and consequently in gout and rheumatism, the joints of the fingers are enlarged and painful, the tophi is more prominent on the dorsal surface of the joints and it sometimes breaks through the skin, so that the chalk-like concretion exudes; knobby enlargements of the proximal ends of the terminal phalanges (end-joint arthritic nodes) may be due either to gout or arthritis deformans and small crab-eye cysts may be formed over the nodes; the tips of the fingers may be bulbous or club-shaped in chronic lung diseases as phthisis or chronic heart affection; the claw hand occurs in consequence of atrophy and paralysis of the interossei and lumbrical muscles due to neuritis of the median and ulnar nerves; the spade hand with large, coarse, thick fingers and broad nails is observed in myxedema, but in which only the soft parts are affected, while in acromegaly, the bones are enlarged; the hand of the individual of a nervous temperament is firm, fine, delicate and

dexterous ; of sanguine temperament, broad, heavy, strong and energetic ; of phlegmatic temperament soft and clammy ; coldness of the hands and feet, with or without tendency to sweating, if persisting for a long time, is due to neurasthenia, anemia, chronic digestive disorders, gout, cardiac or pulmonary diseases, interfering with the circulation) should be observed."

Charaka V. 3. 5th.

"When he does that (vomits), the physician should examine the expectorated matter from the spittoon with attention." *Charaka I. 15. 16th.*

Urine was examined for its color, consistence, taste and smell, only in genito-urinary diseases (*Charaka II. 4 ; Suśruta II. 6*) but sputum, feces and semen as a vitality test and as a prognosis in diseases : "According to the sayings of the wise, his life is at an end, whose sputum, feces and semen sink, when thrown into water." *Charaka V. 9. 14th.* Suśruta gives elaborate details of the prognostic symptoms :—

67. तथास्योक्तासमस्यादन्तपक्षाच्चतुःकेशलोमोदरजखान्, लोभश्च लक्षयेत् । चरक-
संहिता, इन्द्रियस्थानम् ५ ।

68. ततोऽस्य वेगान् प्रतिपाद्यगतामवेक्षित । चरकसंहिता, सूत्रस्थानम्, १५ अः ॥

69. निष्ठूतञ्च पुरोवञ्च रेतश्चाभसि मञ्जति ।

यस्य तस्याशुषः प्राहमन्मनाहुर्नाभिषः ॥

चरकसंहिता, इन्द्रियस्थानम्, १ ॥

“He whose *complexion* is changed into pale-brownish (in Addison’s disease), reddish (hypere-mia ; chlorosis rubra), yellowish (jaundice or icterus) or blue-purplish (cyanosis), he is near his death. He who suddenly loses his modesty, beautiful appearance, ability to hold himself upright and personal charms (in apoplexy, a sudden loss of consciousness is followed by paralysis, due to cerebral hemorrhage or blocking of an artery of the brain by an embolus or thrombus), he can be regarded as dead. Whose *lower lip* hangs down (the lips are loose and pendulous in diphtheretic paralysis or chronic bulbar palsy), *upper lip* twitches up (twitching or trembling of the lips is index of general paralysis or bulbar palsy), or both the lips have the colour of ripe plums (the colour of the ripe plum is dark bluish, that is cyanotic : in diseases of the heart or the lungs, especially the chronic forms, owing to dyspnœa, the lips are open, dry and cyanosed), his life is hard to save. He whose *teeth* are reddish (stained with blood—*sordes*—in typhoid prostration), or pale brownish (stained from the deposit of foul matter in jaundice on the tongue), or like polished collyrium (dark black deposit is found on the tongue in Addison’s disease or nigritis), or have fallen (loosening of the teeth in their

sockets may be due to pyorrhea alveolaris, scurvy, purpura hemorrhagica, and extensive and rapid dental caries is common in diabetes or rachitis), can be regarded as dead. He whose tongue is black (in Addison's disease or nigrites) paralyzed (in basal meningitis, syphilitic lesion, tumor or cerebral hemorrhage), swollen (glossitis may occur in various diseases as variola, erysipelas or septicemia), or dry and fissured (in the typhoid status), is near his death." *Suśruta* I. 31. 2-6¹⁰.

He whose hair looks oily (in hyperthyroidism), though not smeared with oil, does not live long,

70. श्यावा लोहितिका नीला पीतिका वापि मागवन् ।

अभिद्रवन्ति यं ज्ञायाः स परासुरसंशयम् ॥९॥

शरीरपक्वमते यस्य प्रभाष्यतिष्ठतिश्रियः ।

अकल्पाद्यं भजन्ते वा स परासुरसंशयम् ॥१॥

यस्याधरीष्ठः पतितः क्षिप्तश्चोर्ध्वं तथोत्तरः ।

उभौ वा जाण्वन्वाभासौ दुर्लभं तस्य जीवितम् ॥४॥

आरक्ता दृश्या यस्य श्यावा वा सुः पतन्ति च ।

अस्त्रजप्रतिमा वापि तं गतायुषमादिशेत् ॥५॥

कृष्णा सन्धावलिप्ता वा जिह्वा शुक्ला च यस्य वै ।

कर्कोशा वा भवेद्यस्य सोऽचिरादिजह्यात्यसूम् ॥६॥

सुश्रुतसंहिता, सुखस्थानम्, ११-२-६ ।

and knowing this, the wise (physician) should give him up. *Charaka* V. 8. 7¹.

Suśruta says¹². "Nervous diseases, '*prameha*' (diabetes and gonorrhoea), leprosy, hemorrhoids (piles), anal fistula, calculus, '*mūḍhagarbha*' (transverse or scapulo-posterior presentation of the fetus during birth) and abdominal maladies—these eight are naturally hard to cure; but if these are also complicated with the developments of enervation, emaciation, dyspnea, thirst, '*śoṣa*' (desiccation of the body or pulmonary consumption), vomiting, fever, unconsciousness, diarrhea, hiccup and other complications, then the wise physician, desirous of success, should not undertake their treatment. If

71. यस्य केशा निरम्भङ्गा दृश्यन्तेऽभ्यक्तसन्निभाः ।
उपकुक्षायुषं ज्ञात्वा तं धीरः परिवर्जयेत् ॥
चरकसंहिता, इन्द्रियस्थानम्, ८ ॥
72. व्यातव्याधिः प्रमेहश्च कुष्ठमर्शो भगन्दरः ।
अशरीरं सूक्ष्ममन्त्रं तथैवोदरमष्टमम् ॥
अष्टावेते प्रकृत्यैव दुष्प्रकृत्या मङ्गलदाः ॥१॥
प्राणमांसचक्षुस्त्रास-दृष्ट्याशेषवमिज्वरैः ।
सूक्ष्मांतिसारद्विक्काभिः पुनश्चैतैरुपद्रुताः ।
वर्जनीया विशेषेण भिषजा सिद्धिमिच्छता ॥४॥
यत्नं सुप्तत्वं च भयं कम्पाभाननिपीडितम् ।
नरं हजानिभक्तञ्च वातव्याधिर्विनाशयेत् ॥५॥
यद्योत्पीपद्रवाविष्टमतिप्रक्षुप्तमिव वा ।
पिक्कापीडितं गाढं प्रमेहो हृन्नि मानवम् ॥

in nervous diseases, there are complications of edema, insensibility to touch, paralysis of the body, tremor, tumor and pain in the abdomen, the patient dies. If in urinary diseases these complications develop, and with the urine much substances (*albuminuria*) are discharged and boils appear on the body, that patient dies. In leprosy, if the nodules ulcerate, eyes become red, the voice broken and the five kinds of treatment as vomiting and purgation do not succeed, the death of the patient is near. In hemorrhoids (piles), if there are complication of polydipsia, loss of appetite, pain, excessive

प्रभिन्नं प्रक्षुत्ताङ्गं रक्तमेव हतस्वरम् ।
 पञ्चकर्मागुणातीतं कुष्ठं हृत्पीडं कुष्ठिनम् ॥७
 दण्णारोचकयत्नात्तमतिप्रक्षुत्तशोषितम् ।
 शोफातोसारसंयुक्तमर्थोभ्याधिर्विनाशयेत् ॥८
 वातसूत्रपुरोषाणि क्रिमयः शुक्रमेव च ।
 भगन्दरात् प्रक्षवन्ति यस्य तं परिवर्जयेत् ॥९
 प्रयत्नमाभिद्वेष्यं बद्धसूत्रं रुगन्वितम् ।
 अश्वमरी क्षपयत्याशु सिकताशकंरान्विता ॥१०
 गर्भकोषपरासङ्गो मङ्गलो योनिस्तद्वृत्तिः ।
 हनुः स्त्रियं मूदगर्भं यथोक्ताश्चापुपद्रवाः ॥११
 पाशंभङ्गाद्विषे ष-शोफातिभारपौडितम् ।
 विरिक्तं पूर्यमाणञ्च वर्जयेद्दुदराद्धितम् ॥१२
 यक्षान्यति विसंज्ञञ्च श्रुते निपतितोऽपि वा ।
 श्रोताद्धितोऽन्तरण्यञ्च ज्वरेण विपते नरः ॥१३

bleeding, edema and diarrhoea, the patient dies. The anal fistula through which the intestinal gas, urine, feces, microbes and semen are discharged is deadly. In the diseases of hard calculus (*āsmarī*), soft calculus (*śarkarā*) and gravel (*sikatā*-uric acid sands), if there appear edema in umbilical region, testicles, ischuria (retention of urine), and shooting pain, the patient dies quickly. In the transverse presentation, if there is paralysis of the uterus, dull pain (*makkalla*) and spasmodic contraction of the vagina, the gravida dies. In abdominal diseases, if there is deplegia, aversion for food, edema, diarrhoea and inspite of purgation, the intestine remains inflated, then give up

यो दृष्टरोमा रक्ताक्षो हृदि सङ्घातशूलवान् ।

नित्यं वक्त्रे च क्षोच्छ्रस्यात् तं ज्वरो हन्ति मानवम् ॥१४

ह्रिक्क्षाश्वासपिपासार्त्तं मूढं विभ्रान्तलोचनम् ।

सक्ततोष्णसिग्धं क्षीणं नरं क्षपयति ज्वरः ॥१५

आविलासं प्रताप्यन् नित्त्रायुक्तमतीव च ।

क्षीणशोणितमांसश्च नरं क्षपयति ज्वरः ॥१६

श्वासशूलपिपासार्त्तं क्षीणं ज्वरनिपीडितम् ।

विशेषेण नरं हृद्भ्रमतोसारो विनाशयेत् ॥१७

शुक्लाक्षमन्नद्वेष्टारमूर्द्धश्वासनिपीडितम् ।

कृच्छ्रेण बहु निहन्तं यस्मा हन्तोह मानवम् ॥१८

श्वासशूलपिपासान्नविधेः शयन्यमूढताः ।

भवन्ति दुष्कृतस्य गुल्मिनो मृत्युमेष्यतः ॥१९

(treatment). In fevers, if the patient is delirious, unconscious, and is absolutely confined to bed, and while the outside of his body (skin) is cold and inside (in the internal organs) there is hyperaemia, then he dies. In fevers, if there is horripilation, eyes become red, there is an acute shooting pain in the heart, and respiration takes place only through the mouth, the patient is killed by the disease. And in fever, if the patient has hiccup, dyspnea, polydipsia, delirium and wandering eyes, he goes to the abode of death. In fever, if the patient has clouded vision, delirium, paroxysmal somnolence, hydraemia (thinness of blood) and emaciation, the fever kills the patient. In diarrhea, if there are the complications of dyspnea, pain, polydipsia, emaciation, emaciation and fever, the aged patient never lives, though an infant once in a while might survive. In phthisis, if the patient has glazed eyes, aversion for food, jerky respiration, and hyperalgia in seminal discharge (in prostatic calculus), any of these complications is to be regard-

आध्मातं वक्षन्निवन्द' छद्भि'हृत्कादकुम्भितम् ।

वज्राश्वससमाविष्ट' विद्रधिर्नाशयेन्नरम् ॥२०॥

पाण्डु दन्तगच्छो यस्य पाण्डु नेत्रस्य मानवः ।

पाण्डु सङ्घातदर्शो च पाण्डु रोगो विनश्यति ॥२१॥

ed critical. In abdominal tumor, if the patient has dyspnea, pain, polydipsia, anorexia, rupture of the tumor and enervation, death takes place. In a deep-seated abscess (*vidradhi*), if there is abdominal tumescence, anuria, vomiting, hiccup, polydipsia, throbbing pain and dyspnea, he does not live. In icterus (jaundice), the patient dies if his teeth, nails and eyes turn yellowish, and he sees everything yellowish. In gastrorrhagia (hemorrhage from the stomach), if the patient repeatedly vomits blood, his eyes become reddish and he sees everything reddish, he perishes." *Suśruta* I. 33. 3-22.

Pains : "*Boring* (*todana* = as caused by the penetration of sewing needle), *terebrant* (*vedana* = to tear out) *lacerating* (*tāḍana* = concussion as a blow from a rod), *lancinating* (*chhedana* = cutting with a sharp instrument), *dilating* (*āyamana* = radiating), *tensive* (*manthana* = as fire is made by friction of two sticks), *expulsive* (*vikṣepaṇa* = to throw out), *sucking* (*chumuchumāyana* = as a magnet or mustard poultice draws by suction), *burning* (*nirdahana* =

लोहितं हृद्येद् यस्य बहुशो लोहितचक्षुः ।

रक्तानाञ्च दिशो द्रष्टा रक्तपित्तो विनश्यति ॥२२॥

३

सुश्रुतसंहिता, दशस्त्राणम्, ३२, ३-२२ ।

burning), *grinding* (*avabhañjana* = pulverizing), *fulgorant* (*spohtana* = bursting), *shooting* (*vidāraṇa* = penetrating), *evulsive* (*utpāṭana* = to pull up), *throbbing* (*kampana* = tremulous), *dull, sharp, acute, itching, irritant, premonitory* or *after pain* (*vividha-śūla-viśleṣaṇa* = various degrees of pain), *shifting* (*vikiraṇa* = which shifts from place to place as in hysteria), *cramp* or *spasmodic* (*pūraṇa* = which fills up), *paralyzing* (*stambhana* = which causes insensibility in the adjacent area), *wringing* (*avakuñchana* = to press out), *formication* or *itching* (*aṅkuśika* = sprouting, a sensation as of ants or similar objects crawling over the body). By the derangement of nerves, these pains manifest in the 'vraṇas' (abscess, tumor, pustule, boil, carcinoma, eczema, etc.) and if for any reason without (apparent) cause, different kinds of pain appear, or in certain localities they appear repeatedly, they are to be ascribed to nervous origin.

Unilateral eruption (*oṣa*), cutaneous inflammation (*choṣa*), diffuse eruption (*paridāha*), oppressed feeling (*dhumāyana* = as in smoke suffocation), the sensation as if burning coal were spread over the body with the increase of the subjective sensation of heat, and the similar sensation that is felt if a caustic were applied to

a wound,—the pains experienced in these sensations, are of 'pitta' origin ; pains of the abscesses, originating from the vitiation or poisoning of the blood, are the same.

Pruritus (*kanḍū* = itching), heaviness (*gurutva* = heaviness or weight is felt in the chest in hemoptysis, spasmodic asthma, chronic gastritis ; in the head in neurasthenia, hypocondrisis and is occasionally a premonitory symptom of apoplexy ; in the abdomen or pelvis, due to tumors in those regions), somnolence (*suptatva*), tumescence (*upadeha*), numbness (*alpa-redana* = partial anesthesia), paresis (*stambha*) and chilliness (*śaitya*) are of phlegmatic origin." *Suśruta* I. 22. 9⁷³.

"The physician should examine first *vitality* (*āyu* = durability of life) of the patient. Even if there is (good) vitality (signs of long life, manifest in the physical organs), *malady*

73. तीदनमेदनताडनच्छेदनायमनविक्षेपणसुसुप्तमायननिर्द्धनावभञ्जनकोटन-
विदारणोत्पाटनकम्पनविविधयुक्तविश्लेषणविकिरणपूरणसम्भनस्त्रप्रवकुञ्चनारुणिकाः सन्ध-
वन्ति । अनिमित्तविविधवेदनाप्रादुर्भावी वा सुदुर्मुह्यैवागच्छन्ति वेदनाविशेषात्
वातिकमिति विद्यात् । ओषधोषपरिदाहधूमायनानि यत्र गादनङ्गारावकीर्णमिव
पश्यते यत्र ओष्माभिहन्तिः चले चारावसिक्तवच्च वेदनाविशेषात् पैत्तिकमिति विद्यात् ।
पित्तवद्वक्तसमुत्थं जानीयात् । कण्ठगुरुत्वं सुप्तत्वमुपदेहोऽल्पवेदनत्वं सन्धः शैत्यं यत्र
तं त्रैशिकमिति विद्यात् । सुयुतसंज्ञिता, स्वस्थानम्, २९, ८ ।

(etiology and the nature of the pathological manifestation), *season* (of the year in its relation to the disease and its reaction against it), *metabolism* (of the patient; *agni*=internal combustion, that is oxidation), *age*, *physical strength*, *nervous vitality*, *predispositions*, *characteristics* (of the patient), *remedies* (available and their reaction against the disease) and *the region* (*dēśa* : marshy or dry, altitude, low or high land, plain or hilly, salubrity of the climate, prevalence of endemic diseases and of epidemics within the territory).

Signs of longevity : He enjoys long life, who has large hands, feet, sides, back, nipple (papilla mamma), teeth, face, shoulder and forehead; long phalanx, breath (or respiratory organ), eyes and arms; wide brows, precordial region (*stanāntara*=the space between the two nipples), and breast; short crus (*jaṅghā*=the leg, especially the segment between the knee and the ankle), penis and neck; deep breath (or spiritual force), voice and umbilicus; the mamma not high but firm; fleshy, large and hairy ears; whose joints, veins (vessels) and tendons are hidden, all the bodily parts are healthy and strong, all the senses are steady, and the health has persistently improved, that person will have

a long life. He who has never had any sickness from birth and whose body, intelligence and comprehension have progressively been developed, will enjoy a long life. *Suśruta* I. 35. 2-4⁷⁴.

“*Life* is (divided) into three periods : infancy, middle-age and senility. Of them, childhood is up to fifteen years (one minus sixteen), divided (further into three sub-divisions) as sustaining on milk (liquid nourishment), milk mixed with other nourishing substances (in liquid or semi-solid form as barley concoction) and (solid) nourishment. A baby up to one year old sustains on milk, up to two years, milk mixed with other substances, and above two years on (solid)

74. आतुरमुपक्रममाद्येन भिषजायुरादावेव परीक्षितव्यम् । सत्यप्यायुषि व्याध्या-
त्वघ्नवयोदीहवत्सस्वसात्मप्रकृतिभेदजदेशान् परीक्षेत ॥ २

तत्र महापाणिपादपार्श्व-पृष्ठ-सनाय-दशन-वदन-स्तम्भ-सलाट् दीर्घाङ्गुलिपद्मो-
ष्ठासमेक्षणाङ्गु विसीर्षभ्रूक्षानामरोरक्षां ब्रह्मजङ्घामेढुयोवं गन्धोरसस्वस्वरनाभि-
मनुचैर्वह्मसामुपचितमहारीमशकण्यं पश्चान्मक्षिकां क्षातानुलितं सूक्ष्मांगुपूर्व्या विग्रथ्य-
माणशरीरं पश्चाच्च विग्रथ्यमाणहृदयं पुरुषं जानीयाद्दीर्घायुः स्त्रियेभ्यमिति ।

गूढसन्धिशिराज्जायुः संज्ञताङ्गः स्थिरेन्द्रियः ।

उत्तरोत्तरमुत्तेजो यः स दीर्घायुश्चक्षते ॥

गर्भात् प्रवृत्त्यरीणो यः शनैः समुपचीयते ।

शरीरज्ञानविज्ञानैः स दीर्घायुः समासतः ॥४

सुश्रुतसंहिता, सूक्ष्मस्थानम्, ३५, २-३ ।

food. From sixteen up to seventy years of age, is regarded as the middle-age: middle-age is composed of four periods as *pubescence* (*vrddhi* = growth), *adolescence* (*yauvana* = youth), *adulthood* (*sampūrṇatā* = completion of growth), *senescence* (*hāni* = declining period); up to the age of twenty, is the period of growth, up to thirty—youth, up to forty full development or maturity, and from forty to seventy, it slowly and gradually declines. (The skeleton reaches its limit very nearly at the same time as the whole frame reaches its maximum of height, the coalescence of various epiphyses being completed by about the twenty-fifth year. Similarly the muscular system in its increase tallies with the weight of the whole body. The brain, in spite of its increasing complexity of structure and function to which it continues to attain, even in middle life, early reaches its limit of bulk and weight. At about seven years of age it attains what may be considered as its first limit for though it may increase somewhat up to twenty, thirty, or even later years, its progress is more slow after, than before seven. The vascular and the digestive organs as a whole may continue to increase even to a very late period (*Foster's Physiology*, p. 1151). After seventy, elements

(constituent), sense, strength, courage and enthusiasm daily fall off; at this age, one becomes grey-haired and bald-headed and being subject to dyspnea, bronchitis and other complications, becomes incapacitated for all activities (as before) and becomes like a dilapidated cottage, exposed to the fury of rain, storm and tempests. This is called old age." *Suśruta* I. 35. 26⁷⁵.

"Infancy is phlegmatic, youth sanguinary and old-age nervous." *Suśruta* 1. 35. 27⁷⁶.

The following diseases may be *congenital*: malformations, syphilis, idiocy, hydrocephalus, hemophilia, infantile hemiplegia, osteomata, nevi, sclerema, pemphigus, dermatitis neonatorum, tetanus neonatorum, ichthyosis, acute fatty

75. वयस्य विविधं, बाल्यं मध्यं वृद्धमिति । तद्वर्णवोङ्गशब्दोऽपि बालासोऽपि विविधाः—चौरपाः, चौरान्नादाः, अन्नादा इति । तेषु संवत्सरपराः चौरपाः, द्विसंवत्सरपराः चौरान्नादाः, परतोऽन्नादा इति । वोङ्गसमन्वोरन्तरे मध्यं वयसस्य विकल्पो वृद्धयोर्वनं सम्पूर्णता ज्ञानिरिति । तदाविंशतेर्द्विंशतिरिति जीवनमा-
चत्वारिंशतः सर्वधातिन्द्रियबलवीर्यसम्पूर्णता । अतः ज्ञानीषत्परिष्ठापितवत्-
समतिरिति । समतेर्ज्ञानं चोद्यमाधतिन्द्रियबलवीर्योत्साहमहन्वहनि बलीपणितस्त्रावि-
त्यजुष्टं कासश्वासप्रभृतिभिर्बुद्धैरभिभूयमानं सर्वक्रियास्त्रसमर्थं जीर्णानारमिबालिष्ठमव-
सौदन्तं वृद्धमाचक्षते । सुश्रुतसंहिता, सूत्रस्थानम्, १५, २६ ।

76. बाली विवर्धते श्रेया मध्यमे पितृमिव तु ।

भूयिष्ठं वर्धते वायुर्बुद्धे तदीया योजयेत् ॥१७

सुश्रुतसंहिता, सूत्रस्थानम्, १५, २७ ।

degeneration, myotonia congenita, progressive muscular atrophy, icterus neonatorum, atelectasis, hemoglobinuria.

Hereditary diathesis: rheumatism, gout, hepatic disorders, renal disorders, renal calculus, respiratory lesions, diabetes, obesity, adiposis dolorosa, acne, eczema, leprosy, arthritis deformans, hernia, hereditary cerebellar ataxia, hemophilia, alcoholism, pseudo-hypertrophic paralysis, progressive muscular atrophy, cancer.

Diseases peculiar in infancy and childhood: cretinism, infantile paralysis, measles, roseola, scarlatina, cerebro-spinal meningitis, chorea, rachitis, hemophilia, infantile scurvy, hypertrophic cirrhosis of the liver, diarrhoea, adenoids, bronchitis, broncho-pneumonia, spasmodic laryngitis, noma, endocarditis, primary renal sarcoma, eczema, pemphigus, seborrhea, ringworm, diphtheria, hydrocephalus, nodding spasm.

Puberty and adolescence: acne, seborrhea, anemia, chlorosis, chloroma, myxedema, exophthalmic goitre, catalepsy, trance, myoma, myolema, typhoids, meningitis, myocarditis, endocarditis, hysteria, cerebral embolism, epilepsy.

Early adult age: acute tuberculosis, pulmonary phthisis, gastralgia, gastric ulcer, syringomy-

elia, cerebral abscess, cerebral embolism, myoma, periodic paralysis.

Middle age : exophthalmic goitre, myxedema, diabetes, chronic nephritis, cysts of kidney, myocardial diseases, endocarditis, aneurism, leucemia, pernicious anemia, angina pectoris, ataxic paraplegia, dementia paralytica, paralysis agitans, intraspinal hemorrhage, myelitis, locomotor ataxia, psychosis polyneuritica, carcinoma, gout, cirrhosis of liver, gallstones, mollities ossium.

Old age : pruritus, ecthyma, gout, pephigus, epithelioma, carcinoma, gout, arteriosclerosis, cataract, gangrene, bronchitis, broncho-pneumonia, aneurism, prostatic disease, myocardial disease, angina pectoris, cerebral apoplexy, paralysis agitans, melancholia.

Diseases special or predominant in females : chlorosis, osteomalcia, chorea, floating kidney, lupus erythematosus, gallstones, constipation, chorea, hysteria, neurasthenia, catalepsy, goitre, myxedema, adiposis dolorosa, gastralgia, anemia.

In addition to the above-mentioned constitutional, metabolic or infectious diseases, there are of course countless other infectious diseases which can attack all ages and can bring about by slow or rapid process the cessation of vital activities and their co-ordination of the organism.

But though *death* is inevitable to multicellular life, Sśuruta emphasizes that natural death through degeneration of senescence is a very rare phenomenon: "According to Atharva-veda scholars, deaths are of one hundred and one kinds, of which the natural death (through old age) is one while the rest one hundred are accidental (including infection)." *Sūsruta* I. 34. 5". It is an undeniable fact, that protoplasm—the living substance, living a particulate life in unicellular existence and community life in mullicellular existence, under favorable conditions, has not necessarily any limitation of its life, and as every living organism, comes into existence as a protoplasm of a pre-existing living organism protoplasm is potentially immortal. Reproduction among the unicellular creatures is by fission, so in a sense they never die as long as proper conditions are maintained. But life can, also, be preserved under adverse circumstances with arrested vitality as in hibernation of many animals in winter. Even suspended vitality is not incompatible with life as many microb-

77.

एकोत्तरं सृष्ट्यगतमथर्व्याणः प्रचक्षते ।

तत्रैकः कालसंज्ञस्तु शेषा आगन्तवः स्युताः ॥५॥

सुश्रुतसंहिता, सूक्ष्मानुसू, ३४, ५ ।

as, or their spores, can be completely desiccated and kept in that state for many years, and after that if they find a favorable medium, they show their full activities again (*anabiosis*). Grains which have been found in ancient Egyptian tombs which have been lying there in a desiccated state for more than one hundred centuries, have been found to germinate. And many fish can be frozen with water and made an ice block and kept in that condition for any length of time and if it be thawed slowly, the fish can be revived. Only when protoplasm is coagulated, it loses its vitality. Many trees are known, which according to reliable tradition, have lived more than a thousand years. Death comes to a tree by storm, lightning, fungi and parasitic diseases, improper nutrition from the soil either by the exhaustion or excess of some of the salts or the insoluble combination of others, improper moisture or sunlight ; but these are all accidental and are avoidable. It is asserted that there are authenticated cases of men who have lived more than 152 years. Old age is certainly a disease, brought about by the degenerative changes, caused by microbic infection, absorption of their toxins and unhygienic living. But this will be in future more or less controllable with better knowledge of prophylaxis, dietary,

rational living and hygiene. And very few people really die of senile degeneration. What actually happens is this : in the debilitated condition when the resisting power of the organism has been reduced, some infection takes place. Preventive medicine in future will possibly eliminate many of the virulent infections, but it can not imply that death will be preventible. Death is probably nature's economy of life. It eliminates those who are no more capable of reproduction or can not contribute materially to the support and provision of offspring, thus releasing the food-supply to the new-generation for growth, development and progress. Old age (*senility*) is the effect of the cumulative auto-intoxications. Organism in its very functioning—in the metabolic process, produces various toxic products, which, if not thoroughly eliminated, can accumulate in the organism bringing about degenerative changes. According to Metchnikoff toxins are principally absorbed from the putrefactive products of the large intestine and to counteract the activities of the proteolytic bacilli, which can only thrive in alkaline reaction, he proposed the introduction into the large intestine of the most active lactic acid producing bacilli (*bacillus Bulgaricus* or *maya ferment*) in the form of soured and curdled milk,

It is true that the large intestine serves no vital function in the economy of life, and it has been simply developed in animals as an accommodation, so that animals are not compelled to slow the speed and wait for defecation, while running. And animals with comparatively short intestine live relatively longer than the animals with larger intestine. And all the organs of the body do not equally show the signs of senile degeneracy. But the human body is a complex, intricate and delicate machinery. If any of the vital organs is seriously affected, it interferes with the integrity of the organism as all the organs are intimately related and interdependent. A diseased organ like the heart or the kidney can not be replaced like a broken or worn-out part of an auto or aeroplane machinery. They can be only slowly and gradually improved by a regenerating process of relieving them of the burden and tension by proper dietary and rational living. But every disease leaves an indelible mark, every shock an impression and every healed wound a cicatrix. And the effect is cumulative. If all the infections could be controlled, still there would be old age and death brought about by the slow but cumulative effect of the partial retention of the metabolic wastes, defective

hereditary inheritance, mental, emotional, and physical shocks and excitements.

Buffon calculated that the duration of life was six to seven times to that of growth, but Flourens estimated it about five times. As the epiphysis closes about twenty five in man, so it can be calculated that the longevity of man should average from 125 years upwards. This is certainly a respectable age compared to the present standard, though some of the animals, lacking intelligence and control over the environment are reputed to live longer as some authenticated records show : salmon one hundred years ; in the case of a carp one hundred and fifty years ; pike two hundred years ; crocodile one hundred years ; tortoise two hundred years ; eagle one hundred years ; parrot eighty years ; swan eighty years ; ducks and geese fifty years ; falcons one hundred years. In the records of zoological garden in confinement, the rhinoceros is known to have lived longer than thirty-seven years, and the average duration of the life of horses, asses and zebras from fifteen to thirty years, domestic cattle from twenty-five to thirty years, sheep, goats and antelopes from twelve to fifteen years, llama seventeen years, hippopotamus thirty-seven years, domestic swine twenty years, ele-

phants thirty to forty years, lions, tigers, bears about 25 years, domestic cats from twelve to twenty-three years, dogs from sixteen to eighteen years, hares and rabbits about ten years, mice and rats from five to six years, bats about seventeen years, monkeys eight to thirty years (*Ency. Brit.* Vol XVI. p. 975).

DISEASES AND THEIR CLINICAL STUDIES.

“Ailing (*vyādhi*), disease (*āmaya*), sickness (*gada*), terror (*ātañka*), consumption (*yakṣma*) fever (*jvara*), indisposition (*vikāra*), and malady (*roga*) are synonyms. *Etiology* (*nidāna*), *prodrome* (*pūrvvarūpa*), *symptoms* (*liṅga*), *remedy* (*upāśaya*) and *sequel* (*samprāpti*) are the *diagnostics* of a disease. That ‘*etiology*’ means the causes of disease, has been previously mentioned. The premonitory symptoms that are observed before the development of a disease, are termed as ‘*prodromes*’. The symptom of a developed disease (the disease might stay in a latent state and the incubation of many infections may last for many years in a resisting organism) is called the ‘*liṅga*’. Characteristic (*ākṛti*), indication (*lakṣmaṇa*), sign (*chihṇa*), lineament (*saṁsthāna*), trait (*vyañjana*), feature (*rūpa*) are synonymous terms with symptom (*liṅga*). Remedy is called that combined action of medicine (*auśadha*), diet (*āhāra*) and hygienic living (*vihāra*), which cures the disease by counteracting either its

causes or symptoms. Sequel (*samprāpti*), outcome (*āgati*) and after-developments (*jāti*) are synonymous." *Charaka* II. 1. 2⁷.

"*Fevers* are being mentioned in the beginning of the book of pathology, for fever is the first expression of all physical diseases." *Charaka* II. 1. 6⁷.

Fever (pyrexia) in which the normal temperature is markedly exceeded for any length of time above about 37 degree Centigrade or 98.6 degree Fahrenheit, is caused by the disturbance of the heat-regulating mechanism. Whatever stimulates the thermogenetic centre or unduly constricts the vaso-dilators so that the excess of heat can not be dissipated, provokes fever. In sun-stroke, the peripheral nervous mechanism is

78. तत्र व्याधिरामयो गद आतङ्को यस्मा ज्वरो विकारो रोग इत्यनृधानरम् ।
रास्त्रोपलब्धिर्निदानपूर्वकपल्लिङ्गोपशयसम्प्रामितश्च । तत्र निदानं कारणमित्युक्तमर्थे ।
पूर्वकप' प्रागुत्पत्तिलक्षणं व्याधेः । प्रादुर्भूतलक्षणं पुनर्लिङ्गमाकृतिलक्षणं चिह्नं
संस्थानं व्यञ्जनं रूपमित्यनृधानरमित्यखिन्नर्थे । उपशयः पुनर्लुप्तव्याधिविपरीतानां
विपरीतार्थकारिणास्त्रीषधाहारविहारानामुपयोगः सुखानुपपन्नः । सम्प्रामित्यतिर्जाति-
रित्यनृधानरं व्याधेः ।

चरकसंहिता निदानस्थानम्, १ ।

79. इह खलु ज्वर एवादी विकाराणामुपदिश्यते तत् प्रथमलाञ्छरीराणाम् ।

चरकसंहिता निदानस्थानम्, १ ।

paralyzed and consequently the body temperature is considerably raised. But when a toxin is introduced into the blood, the auto-defensive mechanism of the body—adrenals and thyroids—are stimulated and their oxidase-secretions are poured into the blood stream, the heat-generating centre is also excited by reflex and sympathetic stimulation, so that by the enhanced metabolism, the toxic products and their agents can be made comparatively harmless to the organism, if not destroyed. Adrenal secretion raises the blood pressure by constricting the vessels so that the toxins and their pathogenic agents are subjected forcibly to the immunizing action of the blood. Thyroid secretion dilates the blood vessels so that the attenuated toxins can be eliminated by sweating to relieve the kidney of its heavy burden, if it has not been equal to the task imposed upon it. Fever is the physiological expression of the severity of the struggle between the invading enemies and the host for self-defence, that is, the reaction that has been set up in the body to make innocuous the toxins and the micro-organisms that produce them. Fever is the index of the resisting power of the organism against the virulence of the infection. It is the nature's healing process, and indicates that the auto-

protective mechanism of the body is active. Absence of fever in a toxemia of any kind proves the inability of the body to react, owing to deficient sensitiveness of opsonin of the blood and the immunizing glands, either inherited or acquired, or to the fact that the toxin is itself a very powerful paralyzant or anesthetic of the sensory impressions. Hyperpyrexia (fever above 105° F.) on the other hand indicates the hyper-excitation of auto-defensive mechanism and the consequent over-production of the immunizing principles, and if long continued, might lead to the protoplasmic destruction of the red-corpuscles and the endothelial cells by hemolysis and autolysis. This excessive disintegration of the protoplasm is indicated by the increased excretion of nitrogen, sulphur and phosphorus and in extreme cases, acetone, aceto-acetic and B-oxybutyric acids with the urine. And this is attended with many functional derangements. The activity of the digestive glands is diminished, hence loss of appetite and inanition. On hepatic cells is imposed the heavy task of reducing excessive metabolic wastes, especially the vast number of red-corpuscles, and the consequence of the hepatic hyper-activity is the greatly increased production of the hepatic excretory product—the

bile. And if it is continued long, it causes 'bilious remittent fever or malarial hemobloginuric fever' (*paittika jvara*, *Suśruta* VI. 39. 12) in which the urine is brownish yellow in color, containing a good deal of urobilin, less of urea, but more of ammonia, as the excessive quantity of sulphur and phosphorus—the disintegration-productions of abnormal destruction of red corpuscles, become oxidized into sulphuric and phosphoric acids and readily combine with ammonia which otherwise would have been changed into urea. There is of course pronounced jaundice. The liver becomes fatigued and sluggish in its activity. Gradually commences the fatty and granular degeneration of its cells. The kidney also shows its terrible strain by fatty and fibrous infiltration.

I. Fevers.

"Fever is caused by lesions of the body or the mind; for fever otherwise can not be developed in a person without injury." *Charaka* VI. 3. 10^o.

80.

तस्य प्रकृतिरुद्दिष्टा दोषाः शारीरमानसाः ।

देहिनिं न हि निर्वृत्तं ज्वरः समुपसिपते ॥

चरकसंहिता, चिकित्सास्थानम्, ३ ।

“Excessive use or abuse of ‘*snehādi*’ [*Sneha* = unguents, *sveda* = sweating through Turkish bath or other sudoriferous means, *vamana* = vomiting, *virechana* = purgation : absorption, retention (of any toxic matter) or exhaustion fever], *traumata* (*abhighāta* = shock or wound fever), *development of disease* (*rogotthāna* = symptomatic fever as a reaction against the pathogenic germs and the toxins elaborated by them), *tumescence* (*prapūka* = coction of tumefaction, that is inflammatory fever), *fatigue* (*śrama* = fatigue fever), *inanition* (*kṣaya* = consumption, that is consumptive or famine fever), *indigestion* (*ajīrṇa* = dyspeptic fever), *toxin* (*viṣa* = toxemia) *mental derangement* (*sūtmayarttuparyāya* = hysterical fever), *smell of poisonous flowers* (*oṣadhī-putra-gandha* = coyza or hay fever), *worry* (*śoka* = depression fever), *sudden seasonal changes* (*nakṣatra-prapūḍana* = stellar vexations = spring or autumnal fever), *hypnotism* (*abhichāra* = exorcism : hypnotic fever), *enervation* (*abhisūpa* = execration : nervous fever), *desire or passion* (*manas* or *kāma* = unreciprocated and ungratified sensual passion : erotic fever), *hallucination* (*bhūābhisaṅkā* = fear of ghosts : hallucinary fever), the unhygienic living of a woman that has miscarried or has given normal birth

(*puerperal fever*), the establishment of the secretion of milk following childbirth (*stanyāra-taraṇa* = milk fever)—these causing lesion of the nerve etc. produces *fever* in human beings.” *Suśruta* VI. 39, 8.¹¹

“Excessive consumption of astringent, dry or cold food and drinks, excessive use of vomiting, purgation, sweating and snuffs; and over-exercise, retention of feces and urine, fasting, traumata, venery, anxiety, sorrow, vigilance—excess of these things irritate the nerves.” *Charaka* II. I. 8¹².

“In the erotic fever, there is a good deal of contemplation (of the beloved object) and

81. निष्ठातियुक्तैरपि च क्षेद्यायैः कर्मभिर्नुषाम् ।
 विविधादभिघाताच्च रोगोत्थानात् प्रपाकतः ॥
 अनात् क्षयादजीर्णाच्च विषात् सात्कार्त्तुपर्यायात् ।
 ओषधीषुष्यगन्धाच्च शोकात् नक्षतपीडनात् ॥
 अभिचाराभिघापाभ्यां मनीभूताभिश्चक्षया ।
 स्त्रीषामपप्रजातानां प्रजातानां तथाङ्गितैः ।
 क्षान्धावतरणे चैव उवरां दोषैः प्रवर्त्तते ॥८

सुश्रुतसंज्ञिता, उत्तरतन्त्रम्, ३८, ८ ।

82. दृक्क्षलक्षुशीतबलनविरिचनास्यापनशिरौविरिचनातियोगव्यायामवेगसम्भारणा-
 नशनाभिघातव्यवायीर्गन्धोक्षयोथितातिथेकजगद्विषमशरीरव्यासेभ्योऽतिसेवितेभ्यो नाशुः
 प्रकीपनापद्यते । चरकसंज्ञिता, निदानस्थानम्, ११ ।

sighing ; in the fever of sorrow, tears ; in the fever of fear, anxiety ; in the fever of anger, excitement ; in the hallucinary fever, delusion ; and in toxemia, unconsciousness, illusion, intoxication and enervation." *Chandika* VI. III. 115.'³

"In the gastro-intestinal fever, there are anorexia, indigestion, heaviness of the stomach, the irregularity of the heart (beat), semi-consciousness, lassitude, continued fever, unchangeability of the lesion, nausea, salivation, lack of hunger, sliminess of the mouth, fatigue, somnolence and heaviness of the body, polyuria, loose feces and enervation—these are the symptoms in the gastro-intestinal fever." *Charaka* VI. III. 125'⁴.

83. ध्यानं निःवासबहुलं लिङ्गं कामज्वरे व्युत्तम् ।

शोकजे वाप्यबहुलं वासप्रायं भयज्वरे ॥

क्रोधजे बहुसंश्लेषं भूतावेशे त्वमानुषम् ।

सूक्ष्मोद्धमदग्निभूयिष्ठं विषसम्भवे ॥

चरकसंहिता, चिकित्सास्थानम्, ३ :

84. अरुचिश्चापिपाकश्च गुरुत्वमुदरस्य च ।

हृदयस्यापि यद्विषयं तन्मा चालस्यमेव च ॥

ज्वरोऽपि सर्गो बलवान् दीर्घाणामप्रवर्त्तनम् ।

लालाप्रसेको हृत्तासः च प्रायोऽपि यदं सुखम् ॥

सम्बन्धुमगुरुत्वञ्च गात्राणां बहुमूत्रता ।

न विह्वलीर्षा न चाम्बानिज्वरस्थानस्य लक्षणम् ॥

चरकसंहिता, चिकित्सास्थानम्, ३ ।

“Lassitude, watery eyes, yawning, heaviness of the body, fatigue, inclination and disinclination by turn for fire (to sit by the fire side), sun (sun-bath), breeze and water (bath), indigestion, foul taste in the mouth, gradual change of the (physical) strength, complexion and temperament—these are the prodromal symptoms of fever.” *Charaka* VI. III. 25¹⁵.

“Excessive internal heat (hyperaemia), thirst, delirium, quick respiration, illusion, pain at the joints, cessation of the perspiration, and constipation—these are the symptoms in hyperpyrexia (at the onset of malarial fever the blood is driven from the peripheral to the internal organs, where there is excessive congestion, and while the surface of the body shivers with chills, there is increased high temperature).” *Charaka* VI. III. 35¹⁶.

85. आलस्यं मद्यमे सास्त्रे लृग्भयं गौरवं क्षमः ।

उल्लनातपबायुः क्षुभक्तिर्वावनिश्चिती ॥

अविपाकास्यैरस्यं हानिश्च वलवर्णयोः ।

श्लेष्मैकतमल्पश्च उवरलक्षणमयजम् ॥

चरकसंहिता, चिकित्सास्थानम्, ३, २५ ।

86. अन्तर्हृदोऽधिककुण्ठा प्रलापः त्वसर्गं भ्रमः ।

सन्ध्यास्थिरुलमस्त्रे दोषवर्णविनियङ्गः ॥

अन्तर्हृदस्य लिङ्गानि उवरस्यैतानि लक्षयेत् ॥

चरकसंहिता, चिकित्सास्थानम्, ३, २५ ।

Though the principle of Hindu medicine is based basically on humoral pathology, it seems, Sūśruta formed a vague relationship of malaria with mosquito bites and swampy localities, where mosquitoes are developed. And it was ascribed to a particular kind of mosquito, and not to all classes of them.

"There are five types of *mosquitoes* (*maśaka* belonging to the '*Culicidae*' family, consisting nearly of one hundred genera and eight hundred species), namely '*marine*' (*sāmudra* = coastal mosquitoes), '*globular*' (*parimaṇḍala* = perhaps the mosquitoes belonging to the genus '*migarhininae*' which has strongly curved proboscis), *culex elephanti* (*hastimaśaka*), '*dark*' (*kṛṣṇa* = taeniorhynchus) and '*mountainous*' (*pārcvatīya* = anopheles). The biting of the '*mountainous*' mosquito (anopheles) produces an effect like that of deadly insects." *Sūśruta* V. 8. 18¹⁷.

"If the part bitten by a spider becomes swollen, white, black, red or bronzed (cyanotic or degenerative changes), and there are symptoms of

87. मशकाः—सामुद्रः परिमण्डलो इति मशकाः कृष्णः पार्वतीय इति पक्षः । तैर्दृष्टस्य तीव्रकण्डूद्वयशोफश्च । पार्वतीयस्तु कीटैः प्राणहरैस्तुल्यलक्षणः । मखाव-
कृष्टेऽप्यर्थे पिङ्गका' सदाहपाका भवन्ति । गलीकसा दृष्टलक्षणमुक्तं चिकित्-
सितम् ॥ सुश्रुतसंहिता, कल्पस्थानम्, ३, १८ ।

fever, burning pain, dyspnea, hiccup and headache, the prognosis is usually bad." *Charaka* VI. 23. 45⁰⁰.

"There is a kind of mountainous mosquito whose bite causes symptoms like the bite of deadly spiders (*lūta*—*aranaea*)" ⁰⁰⁰.

According to medical experts, tertian(*trtiyaka*) and quartan (*chaturthaka*) fevers (of malarial origin) are produced by nervousness ; while the valley or the marsh *aupatyaka*—at the foot-hill of the mountains, that is the swampy Tarai of the Himalayas where anopheles is found in large numbers and malaria is endemic), and drink or intoxication (*madya-samudbhava* = produced by wine) fevers are ascribed to blood-pollution (*pitta-kṛta* = corruption of the bilious principle, which is the blood). Pneumonia (*pralepaka*) and

88. शोफः श्वेताः सिता रक्ताः पीता वा पिङ्काञ्जरः ॥

प्राचान्तको भवेद्वाहो श्वेतद्विजाश्विरीयहाः ॥

चरकसंहिता, चिकित्सास्थानम्, २२, ४५ ।

88. (a) कण्डूशान् मयकौरेषण्डोफः स्यान्मन्दवेदनः ।

असाध्यकोटसङ्ख्यमसाध्यमयकचतम् ॥

चरकसंहिता, चिकित्सास्थानम्, २२, ४५ ।

influenza (*vāṭavalāsaka*) fevers are said to be of phlegmatic origin. *Sūtrata* VI. 39. 25³.

It has now been definitely proved that the mosquito of the genus of *anopheles* transmits the deadly malarial germ from man to man. It may be possible, however, that there are other carriers of malarial pathogenesis. And *anopheles* is not the only genus that is guilty. Yellow fever is transmitted by *Stegmia calopus*, dengue fever by *Culex fatigans*, filaria *bancrofti* by *Culex fatigans*. But all *anopheles* do not carry malarial protozoa. *Anopheles* has nearly one hundred species (*Culex* two hundred), of which only forty species have been proven experimentally to be the hosts in malaria and in India there are only ten of them as follows : *Myzomyia culicifacies*, *Myzomyia listonii*, *Myzomyia turkhundi*, *Pyretophorus jeyporensis*, *Myzorhynchus barbirostris*, *Myzorhynchus sinensis*, *Nyssorhynchus theobaldi*, *Nyssorhynchus stephensii*, *Nyssorhynchus fuliginosus* and *Nyssorhynchus maculipalpis*. According to Theobald none of the *anophelinae* species

89. वाताधिक्यात् प्रवदन्ति तज्ज्ञासूतीयकश्चापि चतुर्थकश्च ।

श्रीपद्मके मयसमुद्भवे च हेतुं ज्वरे पित्तजनं वदन्ति ।

प्रक्षीपकं वातवशासकञ्च कफाधिक्येन वदन्ति तज्ज्ञाः ।

सुश्रुतसंहिता, अथरतकम्, २, २४ ।

of Feltinella, Bironella, Aldrichia, Chagasia, Chrystia, Kerteszia, Myzorhynchella and Lephoscelomyia have been found to be the bearers of malarial germs.

But the protozoan parasites of the red blood-corpuscles that cause remittent or intermittent malarial fevers, are not the same, and they appear under four chief forms: tertian is caused by plasmodium vivax, quartan fever by plasmodium malaria, estivo-autumnal fever or subtertian malarial fever by plasmodium falciparum (*laverinia malaria*, *plasmodium precox*), quotidian fever by plasmodium falciparum quotidianum.

These four kinds of blood-parasites produce different reactions in the organism according to their characteristics. Plasmodium vivax requires forty-eight hours to complete the cycle of schizogony and sporulates principally in the spleen, liberating toxins which are hemolytic, pyrogenous and hemozoanous, and will provoke an attack of fever with single brood in the human host every forty-eight hours, that is on the third day and accordingly it is called 'tertian' (*trtiyaka*), and in the intervening period there is remission of fever. Plasmodium malaria needs seventy-two hours to complete its schizogon, and it principally sporulates in the peripheral blood, and the liber-

ated toxin causes a severe constriction of cutaneous vessels, thus provoking shivering chills on the surface and chattering teeth, though the temperature of the blood is rising rapidly, and driving the blood centripetally, causing congestion of the internal organs; as it takes seventy-two hours for the cycle, that is, the fever appears every fourth day with a single brood of infection, it is called '*quarten*' (*chaturthaka*). *Laverania malaria* is irregular in its sporulation and needs about from thirty-six to forty-eight hours for schizony, and as it sporulates in the red corpuscles of the blood, it causes an immense destruction of them, and as the pathogenic protozoon needs high temperature for its development, the fever takes place in the autumn, and is therefore called '*estivo-autumnal*' (*śārādīya*). This is the most malignant of malarial fevers, for it not only causes a heavy destruction of the red corpuscles of the blood, and it is calculated that there are nearly 25,000,000,000,000 red corpuscles in an adult human being, and it needs about 3,000,000,000 of them to be affected to cause an acute fever, and if it be below 250,000,000, the malarial fever does not manifest and remains in a latent state; but it can also provoke serious lesion in the brain, pancreas, liver, spleen

and other internal organs by forming thrombi through blocking the capillary passage by the accumulation of plasmodia, swollen endothelial cells laden with hemozoan and sporules. The bilious remittent fever (bilious hemoglobinuric or *blackwater fever* = *pitta-jvara*) is also caused by it by the excessive destruction of erythrocytes which necessarily imposes a heavy labor on the liver, with the consequent production of excessive quantity of bile, which produces jaundice of the tissues and also appears in the urine with other pigments (*hemozoan*) and the urine looks from brownish yellow to blackish in color. The *quotidian* (*anyedyuṣka*) fever may be produced by plasmodium falsiparum quotidianum which takes twenty-four hours for schizogony, or by three broods of plasmodium malaria, triple quartan fever, the parasites coming to maturity on three successive days), two of plasmodium vivax (*double tertian fever*), or two of laverania malaria (*double estivo-autumnal* or *double subtertian fever*).

At the onset of malarial fever, all these types tend to be irregular, for the simple reason that the pathogenic sporozoa are of different ages and inoculated at different times, and only as the disease proceeds, the fever becomes regular,

possibly because the parasites that can not conform to the age period of the majority in their schizogony, when the organism offers least resistance) overwhelmed by the combined attack of the parasites and the toxins liberated by them becomes exterminated by the anti-toxins of the blood) produced as a reaction.

“The fever that lasts for seven, ten or twelve days without interruption, is called ‘*santata*’ (*simple continued fever*, produced by a bacillus, resembling *coli communis*, or the remittent fever produced by *spirocheta carteri*, known also as the relapsing fever or *typhus recurrens*) ; the fever that appears twice in day and night, is called ‘*satata*’ (*double-quotidian* or *Kala azar*, produced by a protozoan parasite *Leishmania donovani*, and it grows in large numbers by fission, and is principally found in the liver, spleen, bone-marrow, lymphatic glands and to a less extent, in the pancreas, kidneys, suprarenals, lungs and testicles) ; the fever that appears on every third day, is called ‘*trtiyaka*’ (*tertian*) ; and which appears on every fourth day, is called the ‘*chaturthaka*’ (*quartan*).” *Suśruta* VI. 39. 31”

90.

सप्तद्वं वा दशद्वं वा द्वादशद्वमथापि वा ।

सप्तद्व्यां योऽपि सप्तौ स्यात् सप्ततः स निगद्यते ।

अक्षोरामे सप्ततको द्वौ कालावनुवर्तते ।

“The unhygienic living after the relief from (the primary onset of) the fever, aggravates the lesion, and owing to the low vitality (of the organism) deranges nerves and phlegma, and causes the development of *double-quotidian* (*satata* = kala-azar), quotidian (*anyedyuṣka*), tertian (*tr̥tīyakā*), quartan (*chaturthaka*) and pneumonic (*pralepaka*) acute fevers.” *Suśruta* VI. 39. 22¹.

“Tremor, irregular onset of fever, congestion of neck, face and lips, insomnia, suppression of sneezing, desiccation of the body, pain especially in the head and the heart, foul taste in the mouth, constipation, flatulence (*ādhmāna* = swelling) and yawning are the symptoms of ‘*vāta*’ (cerebro-spinal estivo-autumnal pernicious) fever.

Onset of fever with rigor, diarrhoea, diminished sleep, vomiting, tumescence of the neck, face, lips and nose, sudoresis, delirium, bitter taste in

अन्यद्युष्कत्वहोरावादेककालं प्रवर्तते ।

दतीयकसृतीयोऽस्ति चतुर्थोऽस्ति चतुर्थकः ॥२१

सुश्रुतसंहिता, उत्तरतन्त्रम्, २८, २१ ।

91.

आमाणां ज्वरसृक्तानां मिथ्याहारविहारिणाम् ।

दोषः स्रव्योऽपि संहृदो देहिनामनिलिरितः ॥

सततान्यद्युष्कवाख्य-चातुर्थान् सप्रलेपकान् ।

ककस्थानविभागेन यथासंख्यं करोति हि ॥

सुश्रुतसंहिता, उत्तरतन्त्रम्, २८, २१ ।

the mouth, semi-consciousness, hyperpyrexia, intoxicated state, polydipsia, the yellowish tinge of the feces, urine and the eyes, and vertigo are the symptoms in 'pitta' fever (*bilious remittent fever* : known also as malarial hemoglobinuric or blackwater fever).

Heaviness of the body, chills, expectoration, horripilation, excessive sleep, sluggish circulation, mild onset of fever, salivation, sweet taste of the mouth, low fever, vomiting, lassitude of the body, indigestion, acute coryza (*pratisyāya* = profuse secretion of the watery mucus from the nose), loss of appetite and whiteness of the expectoration and the eyes are the symptoms of '*śleṣma*' (influenza) fever." *Suśruta* VI. 39. 11-13".

५२.

वेपथुर्विषमो वेगः कण्ठीष्ठसुखशोषणम् ।

निद्रानाशः खवस्तम्भो गात्राणां रीचामिव च ॥

शिरोष्ठद्गात्रदग्बन्त-वैरस्यं बहुविट्कता ।

जृम्भाधानं तथा यूलं भवत्यनिलजि ज्वरे ॥११

वेगस्तोष्णोऽतिसारश्च निद्राल्पत्वं तथा बालः ।

कण्ठोष्ठसुखनामानां पाकः खेदश्च जायते ॥

प्रलापः कटुता वक्त्रे मूर्च्छा दाहो मदलृषा ।

पोतविष्मूत्रनेत्रत्वं पैतिकी सप्त एव च ॥१२

गौरवं शीतस्तृष्णो रोमद्वर्षोऽतिनिद्रता ।

स्त्रीतोरोधो रगल्पत्वं प्रसृक्को मधुरास्यता ॥

नाल्युष्णमादता षड्द्विंशसादोऽविपाकता ।

प्रतिम्लायोऽवधिः कासः कफजोऽष्णोऽथ शुक्रता ॥१३

सुश्रुतसंहिता, कृत्तरतन्त्र, १८, १९ ।

Eruptive Fevers : "Feverishness or chilliness by turns ; pains in the bones, joints and the head (headache) ; watery, glazed or reddish, dilated or contracted eyes ; hissing sounds and pain in the ears ; neck as if covered with grains (*śūka*=eruptive typhoid papules) ; somnolence ; illusion ; delirium ; coughing ; dyspnea ; loss of appetite (*anorexia*) ; delusion ; the tongue is rough and has the color of burnt coal (dry, brown, thickly coated, fissured and tremulous) ; inertia of the body ; nasal discharge mixed with blood (nose-bleed) ; bilious sputum (vomiting) ; agitation of the head ; insomnia ; angina pectoris ; scanty perspiration, urination and defecation ; the patient does not look emaciated ; sound in the neck (sonorous or sibilant rales indicating bronchitis) ; appearance of rose-red exanthem (*koṭha*) and rashes (*maṇḍala*) ; aphasia (*mūkatva*) ; lesion in the circulatory system, heaviness of the epigastrium (flatulence) ; and the delay in the coction of the deranged humors (the long duration of the disease and convalescence from it) are the symptoms of the typhoid fever." *Charaka*. VI. 3. 85⁹³.

“Altogether through (varied) lesion, there are thirteen kinds of *typhoid fevers*.” Charaka I. 17. 16^a.

It is very probable that all the eruptive fevers have been classified by Charaka, as *typhoid fevers* (*sannipāta jvara*), including in the category typhus, paratyphoid, cerebro-spinal meningitis, measles, mumps, erysipelas, diphtheria, toxemia, septicemia, pneumonia, puerperal fever and small pox. Charaka and Suśruta both mention smallpox as ‘*masūrikū*.’

“Due to lesion of the phlegma and the biles (circulatory blood), tiny rashes, anorexia, exudative vesicles, called ‘*romānti*’ (varicellae or chicken

साक्षादे कलुषे रक्ते निभुंघे चापि दर्शने ॥
 सखनी सबजी कर्षी कण्डः यूक्तेरिवाहतः ।
 तन्मा मोहः प्रक्षापय कासः नासोऽवचिर्धमः ॥
 परिदग्धा खरत्पशा जिह्वा क्लृप्ताकृता परम् ।
 शीबनं रक्तपित्तस्य कफेनोन्मिश्रितस्य च ॥
 शिरसो शीतनं दृष्ट्वा निद्रानाशो हृदि व्यथा ।
 स्नेहसूक्ष्मपुरीषाणां चिराद्दर्शनमल्पम् ॥
 कृमयत् नतिगामाणां प्रतप्तं कण्डूजनम् ।
 शीतानां श्वावरक्तानां मन्थनानाञ्च दर्शनम् ॥
 सूक्ष्मत् शीततां पाक्वीं गुदत्वमुदरस्य च ।
 चिरान् पाकञ्च दाबाणां सन्निपातज्वराकृतिः ॥

चरकसंहिता, चिकित्सास्थानम्, ७ ।

94. समे चैको विकारासो सन्निपातास्त्रयोदश ॥

चरकसंहिता, स्वस्थानम्, १७ ।

pox) appear with fever, itching and polydipsia. From bile and phlegma (corruption of), the tumescence of the pustules that appear all over the body like lentils (*ervum lens* : *ervum minus*), is called the *variola* or *small pox* (*masūrikā*).” *Charaka* VI. 12. 73^{94a}.

“The painful, copper-colored, bronzed pustule that appears all over the body and within the mouth with burning fever, is called the *variola* (*masūrikā*).” *Suśruta* II. 13. 30⁹⁵.

“The typhoid fevers after passing through a crisis on the seventh, tenth or twelfth day, either become relieved or kill the patient.” *Suśruta* VI. 39. 18⁹⁶.

As it was believed that disease was due to the derangement or the disharmonious combination of the humors of the body, the cure lay in their

94. (a) चूदप्रमाणाः पिङ्काः शरीरं सर्वान्नागाः सज्वरदाहदन्ताः ।

कश्च्युताः सार्वत्रिकप्रसेका रोमानिकाः पित्तकफात् प्रदिष्टाः ॥

याः सर्वगात्रेषु मसूरमात्रा मसूरिकाः पित्तकफात् प्रदिष्टाः ।

चरकसंहिता, चिकित्सास्थानम्, १२ ।

95. दाहज्वररुजावन्तस्तावाः स्त्रीटाः सपीतकाः ।

गात्रेषु वदने चान्निर्विज्ञेयास्ता मसूरिकाः ॥१०॥

सुश्रुतसंहिता, निदानस्थानम्, १२ ।

96. समने दिवसे प्राप्ते दग्धने दादग्धेऽपि वा ।

पुनर्धीरतरो भूत्वा प्रशमं याति कृमि वा ॥१८॥

सुश्रुतसंहिता, चरकतन्त्रम्, १८, १८

proper combination by coction. The internal heat that was supposed to cause coction of the humors and thus to preserve the balance of the humors, requisite for normal health, was supposed to be dissipated to the peripheral organs by morbid agents and thus to produce fever. Cure from a disease only took place when the internal combustion (metabolism or oxidation) was normalized again. This was brought about by hygienic living and dietary regulation. Medication was but supplementary. It is well known that quinine, the bitter alkaloid of the cinchona bark is a powerful remedy against the malarial plasmodia. Though cinchona is a native of the South American Andes, it belongs to the Rubiaceae family of which there are many members in India. Charaka in the treatment of malarial fever mentions a bitter (*tiktaka*) juice of leaves or bark, or concoction of a dry bark, but it is very hard now to identify what he meant by it :

“In new fever, fasting, sweating, time, barley water and bitter extract (*riktako rasa*) cause the coction of raw humors (that is, bring about the cure).

“In the cerebro-spinal remittent fever and influenza, when the patient is thirsty, give him

hot water to drink. In the bilious remittent fever, cook bitter (bark or root) in water and when it is cooled, give it to drink. Such a concoction is stimulating (*dīpana* = digestive), oxidising (*pāchana* = which causes coction of the humors), (febrifuge (*jvaraghna*), blood-purifying (*śrotasām śodhanam* = purifier of the streams, as the blood, lymph, urine), vitalizing (*valya*), appetizing (*ruchi-kara*), sudorific (*gharma-kara*) and is beneficial." *Charaka* VI. 3. 129.⁹⁷

That this treatment was only meant for malarial fevers, is clearly indicated by the following passage : "At the onset of the (malarial) fever fasting is proper. But it should not be followed in consumptive, nervous, phobia, excitement, depression and fatigue fevers. By fasting pathogenic agents (*doṣa*) are destroyed and when metabolism is stimulated, the body

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खङ्गं खेदं कालो ज्ञानशक्तयो रवः ।

पाचनान्विपक्वाणां दोषाणां तद्वत् ज्वरे ॥

दृश्यते खलिलखोचं दद्याद्वातकफज्वरे ।

नद्योत्थे र्पैतिके चाप्यधीतलं तिक्तकैः प्रयत्नः ॥

दोषघ्नं पाचनार्थं च ज्वरक्षन्नुभयवत् तत् ।

जीतघ्नां शोधनं वक्ष्ये खलिलोदकरं शिवम् ॥

चरकसंहिता, चिकित्सास्थानम्, ३ ।

becomes light and hunger appears. But fasting should not lower vitality (that is fasting for a longer period than is necessary is injurious), for recovery depends on the vitality of the patient, and the object of treatment is recovery."

Charaka VI. 3. 128^o.

"In all kinds of fever, treat it by counter-acting the causative factors. In fatigue, consumption and wound (*abhighāta* = wound or traumatism) fevers, treat the original disease." *Suśruta* VI. 39, 73^o.

"As long as the fever patient does not regain his strength (i. e. does not completely recover), he should not indulge in shower-bath (*pariṣeka*), plunge-bath (*avagāha*), beverages, vomiting etc. (*samsodhana*), inunction, day-sleep, exposure to

98. उत्तरे सङ्क्रमणेवादावुपदिष्टवर्ते अत्रात् ।

अयानिषमवक्रोथस्त्रानशोकशमः इवात् ॥

सङ्क्रमणे चयं नीते दोषे सन्धुचिन्तिऽनसि ।

विश्वरत्नं सङ्क्रमणं बुद्धिवालीपयावते ॥

प्राचाविरोधिना च न सङ्क्रमणेनोपपादयेत् ।

वक्रादिभ्रान्तमारोग्यं वदथोऽयं क्रियाक्रमः ॥

चरकसंहिता, चिकित्सास्थानम्, १, १२८ ।

99. चिकित्सीयं अत्रान् सङ्क्रान्तिं निमित्तानां विपर्ययः ।

अनन्यव्याभिधानात् नूतनव्याधिमुपाचरेत् ॥७१

सुश्रुतसंहिता, उत्तरतन्त्रम्, २८, ७१ ।

cold, exercise and sexual intercourse." *Suśruta* VI. 39. 68¹⁰⁰.

"If a fever patient suffers from indigestion, old wine and barley broth is beneficial to him. If a fever patient suffers from coryza and anorexia (influenza), let him drink whey mixed with 'trikaṭu' (a mixture of *śunṭhi*—ginger, 'maricha black pepper, *pippala*—long pepper; Gr. '*diu trion piperidon*' made of the same ingredients, *piperis longum*, *piperis nigri*, and *zingiberis*). In an exhaustive continuous fever, if the patient is emaciated, on the road to recovery, mentally depressed, in cerebro-spinal or bilious remittent fever, or if the pathogenesis is not well-marked, if the patient is desiccated, has polydipsia and burning sensation, drinking of milk will benefit him. But in new fever, milk should not be drunk, as it might even cause death:" *Suśruta* VI. 39. 63¹⁰¹.

100. परिपेक्षावगांधं च कंदान् संशोषणानि च ।

क्षानाभ्यङ्गदिवास्त्र-शीतव्यायामयोधितः ।

न भजेत् ज्वरीत्सृष्टी यावन्नी बलवान् भवेत् ॥

सुश्रुतसंहिता, उत्तरतन्त्रम्, ३८, ६८ :

101. मद्यं पुराणं मन्दाग्नेयं वात्रोपहितं हितम् ।

सव्योषं वितरेत् तन्नं कफारोचकपीडिते ॥

क्षयोऽल्पदीपो दीनश्च नरो जीर्णज्वराह्निः ।

विवक्षः सृष्टदीपश्च बन्धः पित्तानिलज्वरी ॥

*In a long-standing continuous or remittent fever, if the patient becomes emaciated, he should be treated by light and easily-digestible food for his fever. Broth of a bean (*mudga* = *phaseolus mungo*), red lentil (*masūra* = *eroum hirsutum*), gram pea (*chanaka* = *cicer arietinum*), plantain (*musa paradisaica*), and dolichon biflorum. The fever patient that likes meat, can take the partridge (*perdicum cheniniensium*), *perdicum francolinorum*, black antelope (*anteloparum nigrarum*), hystricum, small deer, hare (*leporum*), black-tailed deer, golden-colored deer and antiloparum albarum. The crane (*gruidæ*), heron (*ardeidæ*), peacock (*pavo*), chicken (*gallos domesticos*) and heath-cock (*tetraoninnæ*), are hard to digest and very excitant; for this reason they are not prescribed by many physicians. But when the fever patient is nervous, it can be given in a moderate quantity." *Susruta* VI. 39. 67¹⁰².

पिपासासः सदाहो वा पयसा स सुखो भवेत् ।

तदेव तु पयः पोतं तद्धो हन्ति मानवम् ।

सुयुतसं हिता, उत्तरतन्त्रम्, १८, ६१ ..

102.

सततं विषमं वापि क्षीणस्य मुञ्चिरोल्लितम् ।

ज्वरं संभोजनैः पयसि क्षुभिः समुपाचरेत् ॥

सुह्रान् ससृण्यवकान् कुञ्जव्यान् समकुट्टकान् ।

आहारकाक्षि येषां ज्वरिताय प्रदापयेत् ॥

But Charaka only recommends their broth and not their flesh; however, this meat-broth can be a little acidulated with the admixture of pomegranate (*punica granatum*) to make it more palatable VI. 3. 165¹⁰³.

"Milk boiled together with ginger, raisins and dried dates, and mixed with honey or sugar relieves thirst and fever. Or the milk might be diluted with water four-fold and cooked together; this is beneficial in old fever, and the drinking of hot milk is good in bilious remit-

खाद्यान् कपिञ्जलानेषान् पृषताञ्जरभाञ्जगान् ।

कालपुष्कान् कुरङ्गान् तथैव स्यमादकान् ॥

मांसार्धे मांससामग्र्यां ज्वरितानां प्रदापयेत् ॥

सारसकौञ्चशिखिनः कुङ्कुटांसितिरौलया ।

गुह्यत्वाच्च शंसन्ति ज्वरे केचिच्चिकित्सकाः ॥

ज्वरितानां प्रकोपन्तु यदा याति समीरणः ।

तदैतेऽपि हि शस्त्रके मादाकालीपपादिताः ॥

सुश्रुतसंहिता, उत्तरतन्त्रम्, ३८, ६७ ।

103.

खाद्यान् कपिञ्जलानेषांश्चोरागुपचक्रकान् ।

कुरङ्गान् कालपुष्कांश्च हरिणान् पृषतः शयान् ॥

प्रदद्यान्मांससामग्र्यां ज्वरिताय ज्वरापहान् ।

दैवदद्यान्नमकान् वा रसान् काली विचक्षणः ॥

कुङ्कुटांश्च मयूरांश्च तित्तिरिक्कौञ्चवर्तकान् ।

गुह्यत्वाच्च शंसन्ति ज्वरे केचिच्चिकित्सकाः ॥

चरकसंहिता, चिकित्सास्थानम्, ३, १६५ ।

tent fever. Milk is restorative in all consumptive fevers; it always produces good result whether drunk hot or cold with whatever medicine prescribed for the particular fever." *Charaka* VI. 3. 196¹⁰⁴.

"The embrace of maidens that are pretty and well-shaped, relieves the chills of (malarial) fevers, by imparting the natural warmth of their body." *Charaka* VI. 3. 208¹⁰⁵.

"In old pneumonic or nervous fever, if the patient suffers from chills, heat should be applied to warm him up, which is very beneficial in such a case (drinking of hot concoction, hot wine, warm bath, hot salve and fomentations are recommended)....The body should be covered with warmed cotton or silken clothes. If the

104. सनागरं सख्यीकं सद्यतचीद्रव्यकरम् ।

श्रुतं पयः सख्य्युरं पिपासाज्वरनाशनम् ॥

चतुर्गुणिनाशना वा श्रुतं ज्वरहरं पयः ।

धारोष्णं वा पयः सद्यो वातपित्तज्वरं जयेत् ॥

जीर्णज्वराणां सख्यौ वा पयः प्रशसनं परम् ।

पेयं तदुष्णं शीतं वा यथासौरीयैः श्रुतम् ॥

चरकसंहिता, चिकित्सास्थानम्, ३, १९० ।

105. चारुपचितगानाच्च तरुण्यौ यौवनीश्रवा ।

चाङ्गे वाष्पयन्त्याद्यु प्रमदाः शिशिरं ज्वरम् ॥

चरकसंहिता, चिकित्सास्थानम्, ३, २०८

patient feels fatigued anoint the body with aloe (*aquilaria agallocho*). And well-breasted, pretty and artful maidens in the first inflorescence of their youth, should massage gently his debilitated body. And the maidens with the face like the autumnal moon, eyes like the blue lotus, long-curved tremulous brows, complexion like molten gold, bright-red lips (like the *bimba* fruit = *memordica monadelphica*), narrow abdomen (slender waist) but broad expansive pelvic region, body anointed with delicate fragrance (*croco sativa* and *aquilaria agallocho*), firm, round and elevated breasts, dressed in fine-smelling, washed and white loose dress, as a wild-creeper (entwines round a tree), should embrace him closely. But when the patient seems to be enlivened, then the maidens should be removed. When by the delightful contact of the maidens, the chills have disappeared, the patient should take pleasant and beneficial diet.” *Suśruta* VI. 39. 134¹⁰⁶.

106.

कफघातोत्पद्योऽपि ज्वरयोः शीतपौडितम् ।
 दिग्बादुश्चैव वगेण परशोष्णो विधिर्हितः ।
 सिञ्चेत् कोष्ठीरारणाल-शुक्लगोमूत्रमस्तुभिः ।
 दिग्बात् पलाशेरथवा सुरसार्जं कथिमुच्चैः ॥
 चारुतैलेन चाभ्यङ्गः सशुक्तिर्न विधत्ते ।
 पानमारगुधादेश्च कथितस्य विशेषतः ॥

Prophylaxis in malarial fever can be summed up in these words: (a) destruction of mosquitoes; (b) the prevention of the entrance of the parasite into the human body; (c) increasing resistance of the body against the parasite.

As the mosquitoes require shallow, stagnant water for breeding and development of their larvæ, the first requisite for a determined fight against malaria, is the awakened public sentiment against this pernicious and malignant

अवगाहः सुखी च वातघ्नकायसंयुतः ।
 शिला शतं क्रमैरभिः सुखी जलसेवितम् ॥
 प्रवेशीणि ककार्पास-कौश्यान्वरसं वृतम् ।
 शाययेद् ग्लानदेहस्य कालागुरुविभूषितम् ॥
 स्तनाब्जा रूपसम्पन्नाः कुशला नवयोवनाः ।
 भजेयुः प्रमदा गावेः शोतदैव्यापहारिभिः ॥
 शरच्छशाङ्कवदना गौलोत्पलदलेष्वाः ।
 स्फुरितश्च खतामङ्ग-ललाटतटकम्पनाः ॥
 प्रलम्बिबिलसत्काशो बिम्बीफलनिभाधराः ।
 कशोदर्योऽतिबिस्तीर्ण-जघनोद्भङ्गलसाः ॥
 कुङ्कुमागुरुदिग्धाङ्गो घनतुङ्गपयोधराः ।
 सुगन्धिधूपितशृङ्खलसांशुकविभूषणाः ॥
 गदमालिङ्गयेयुस्तं गरं वनलता इव ।
 प्रह्लादश्चास्य विज्ञाय ताः स्मोरपनयेत् पुनः ॥
 तासामङ्गवरज्ञेन निवारितहिमज्वरम् ।
 भोजयेद्व्रतमन्नञ्च यथा सुखमवाप्नुयात् ॥११४॥

सुयुतसंज्ञिता, चतुरन्तराय, ११२ ।

disease. For without communal co-operation, it can not be accomplished. There should be complete surface and subsoil drainage and the ground should, be so levelled by filling up the ditches and the natural depressions that there can not be any accumulation of water for the breeding of the mosquitoes. All the ponds, lakes, canals and water-ways should be deepened, and the water-plants that usually float on the surface as safe breeding place for mosquitoes, protecting the larvæ from the fish must be regularly and systematically removed. Fish should be cultivated in every pond, lake or canal, especially the '*giradinus poeciloides*' which is a voracious feeder on eggs, larvæ and pupae of mosquitoes. All trees on the bank of the water or near the dwelling house which takes away sunshine or interferes with free current of air, should be felled, for the mosquitoes need a dark place to hide in the day time. Laveran recommends the plantation of castor oil plants (*Prophylaxie du paludism*, p. 134), the odor of which he believes drives away mosquitoes. However the promise held by the Eucalyptus tree has been rather deceptive. Bats appear to be voracious feeders of mosquito larvæ.

The next thing is to protect the inhabitants

against the mosquito bites. Mosquitoes can fly nearly a mile's distance from the breeding place, and many of them go out and bite only in the evening and at night. And it is the females that do the biting. The males live on vegetable and fruit juice. The life of a female mosquito is about a month. It bites any vertebrate it might come across in order to get blood which it needs as nourishment for its eggs. But it is only by biting a malarial patient, it can be infected with the malarial plasmodium, which it transmits to others when biting again. Therefore to prevent the spreading of malaria, it is necessary that the inhabitants be protected from mosquito bites, for in a malarial region, almost every one might harbor malarial germ in the blood, though the disease is in a latent form and there is hardly any apparent symptom, excepting a little malaise and lassitude. The mosquito bite can be easily prevented by using mosquito wire netting in the windows, which does not prevent the circulation of air. Where it can not be done, mosquito-nets must be used in the bed. And if it is necessary to go out at night, one should take care to wrap the body in clothes or smear the body with carbolated vaseline and to use a fine-gauze net round the face and neck.

Quinine is the best prophylactic and curative agent against malaria. In the endemic malarial region, it is a wise policy to take 2 to 4 grains of quinine daily, as a preventive medicine, which seems to be much more effective than larger doses at longer intervals. Chlorhydrate of quinine is preferable in an irritant stomach, or Sulphate of quinine can be given which is much cheaper. During the acute stage of the malarial fever, it is better that quinine be administered in doses not smaller than one gram, nearly four hours before the expectation of the chills, as quinine takes nearly four hours to act, and it should act energetically at the time of the sporulation—when the young broods are liberated and which provokes the chill, and the sporules then should be destroyed, for it is very doubtful how far the old gamets are affected by quinine. Quinine should be given every day, preferably by mouth and in powder form or in solution, and the bitter taste can be covered and neutralised by addition of syrup glycyrrhizae (syrup of licorice) every day when the attack is expected, until the disease is broken, as it may be due to double infection by the tertian, estivo-autumnal and quartan parasites or to the treble infection of the quartan. And with the exception of rein-

fection, relapses can be usually prevented by giving quinine once a week for four weeks from the occurrence of the last chill.

During the paroxysm, treatment needs simply to be symptomatic: in chills hot drink, warm covers and hot fomentations can be applied to relieve the shivering cold sensation, and during the succeeding hot period cold application on the head to relieve headache and cold drink to relieve thirst. But the sweating period should not be shortened by antipyretics as it might harm the organism by retaining the malarial toxins which perspiration tends to eliminate, and that is why the sweat of a malarial patient has a peculiar odor.

It goes without saying that nourishing food and hygienic living strengthens the resisting power of the organism against any infection.

II.-Diarrhœa.

"Excessive consumption of indigestible (*alimentary diarrhœa* provoked by the irritation of the intestinal mucosa through the indigestible residue), *fatty* (fatty d. or d. adiposa, caused by the splitting of the fat into irritant fatty acids, or as in jaundice with the deficiency of the bile, by the evacuation of the undigested fatty sub-

stances), dry (mechanical or *serous d.* caused by an augmentation of pressure within the alimentary canal with exaggerated serous transudation into the intestine), hot (*inflammatory d.*), liquid (*asthenic d.* caused by the fermentation brought by the dilution of the digestive enzymes by an exceedingly large quantity of liquid), coarse (*linteric d.* in which the undigested or half-digested food particles are contained in the discharges), ice-cold (*congestive d.* is induced by mechanically stimulating the peristaltic contractions and possibly glandular secretions by a large quantity of cold water, thereby increasing the amount and fluidity of the intestinal contents, and by diluting the gastro-intestinal secretions which interfering with digestion, provokes fermentation; the drinking of ice-cold water and beverages cause loose movements for they mechanically bring about contraction of the superficial vessels of the mucosa, followed by reaction and congestion of the membrane, and if long continued to intestinal catarrh), and *improper foods* [diarrhoea is provoked by all kinds of food poisoning, *bromatotoxismus* either putrefactive, fermentative or infective with all toxemic symptoms: meat-poisoning or *kreatotoxismus* arises from decomposed meat (proteus group alone or associated with

colon bacilli), meat of diseased animals or infected animals (as tuberculosis); fish-poisoning or ichthyotoxismus arises from eating fish that is venomous, or only at the spawning season or from feeding upon putrefactive substances or from its decomposed ptomaine poisoning as in rotten egg; milk-poisoning or galactotoxismus arises from taking contaminated or spoilt milk: milk may be contaminated from various sources as it is one of the best culture mediums of pathogenic germs, as from tuberculosis from a diseased animal, dust on the animal, filthy hand of the milker, unclean receptacle, or, washed with polluted water, or from exposure when left uncovered for a considerable period, and milk usually contains myriads of bacteria, and in it are frequently observed colon bacilli and bacillus enteritidis, and to a lesser extent bacillus enteritidis sporogenes, staphilococci, paratyphoid and occasionally typhoid germs; grain-poisoning or sitotoxismus arises from using spoilt, contaminated or sprouting grains, as pellagra in the use of diseased maize, or in the spoilt pea, paraplegia, or lathyrism (*lupinosis*) in the admixture of the grain with the seeds of the '*lathyrus*'; it is well known that sprouting potatoes contain at the mouth of the sprouts or the greenish surface of

the skin exposed to the sun, a glycerid alkaloid-solanine, while many of the mushrooms contain another toxic alkaloid-muscarin], *uncooked food* (uncooked food is not only hard to digest as cooking softens the tissues, but many of the vegetables and fruits might contain fungi, amœbæ and the eggs of many intestinal worms which are thus introduced into the alimentary canal where they make their habitat, and provoke diarrhœa either by irritating the mucosa, or causing ulceration or impaction), *disharmonious combination of foods* (as milk and acid, or sugar and acid which is apt to cause fermentation in a weak or debilitated stomach), repeated eating before the former meal has been digested (*adhyasana*=d.ab ingluvie), indigestion (*dyspeptic d.*) excessive use or abuse of purgation, vomiting and sweating (d. cathartica), *poisoning* (in chronic mercurial poisoning perhaps due to the corroding action of its salts, there is an extensive ulceration of the alimentary canal, followed by fetid diarrhœa, anemia, foul breath, falling out of the hair, brittleness of the nails, salivation, stomatitis, buccal ulcers and enterocolitis; in acute or chronic arsenic poisoning, there is pronounced epigastric and abdominal pain, followed by vomiting and diarrhœa

of rice-water and often bloody and offensive stools, suppression of urine or bloody urine, neuralgic pains and paralysis ; in lead poisoning, the gums have a bluish black tinge, progressive anemia, nutritive disturbance, constipation, but often alternating with diarrhœa), anxiety (*emotional d.*) depression (nervous or *neurotic d.*) *polluted water* (water containing dysenteric germs or large amount of earthly alkali as magnesium or sodium, calcium or potassium carbonates, dissolved from the soil) excessive drinking of *spirituous liquor* (in chronic alcoholism diarrhœa results from the thickened, inflamed, congested and often ulcerated intestinal mucosa, imperfect gastro-intestinal indigestion, interference with colonic absorption, disturbance of the biles due to congestion and cirrhosis of the liver, and the effect of alcohol upon the local and cerebro-spinal nerve-centres controlling intestinal nutrition, secretion and motility, thus provoking diarrhœa alternating with constipation), mental derangement (*neurogenic d.*), sudden seasonal changes (thermic or *summer d.* of the hot season : it may be also induced by sun or heat stroke accompanied by enervation, dizziness, cramp, disturbed vision, dry skin, rectal and vesical irritability ; in exposure to

cold and dampness, the surface of the body is suddenly chilled with the lowering of the surface temperature, which causes the contraction of the cutaneous blood-vessels, leading to congestion of the internal organs, chiefly the intestine and viscera, and reflexly irritating the motor and secretory nervous mechanism—thus leading to evacuations; in sudden change of climate, diarrhœa may be, also, induced as hill or spruce d.), excessive use of lavage (*mechanical d.*), *obstructive* (due to carcinoma, tumor, calculi, fecal impaction or obstruction of the passage with the tapeworms as *tenia solium* which is introduced with incompletely cooked pork and might grow from 6 to 12 feet, *tenia saginata*, from incompletely cooked beef varying in size from 10 to 25 feet, *tenia lata* from half-cooked fish varying in size from 5 to 25 feet, and *tenia nana* (dwarf tape) from one-fifth to one and one-fourth inches in length; diarrhœa is provoked by them either because the formed feces can not pass through the obstructed passage and only watery liquid can ooze through, or due to irritation from the mucosa caused by them), and by '*krimis*' (worms *uncinariasis* or hookworm, *ascaris lumbricoides* or round worms, *oxyuris vermicularis* or threadworm, *tricuris trichiura* or whipworm, *trematodes*

or flukeworms and strongyloides intestinalis ; microbes : entamebazer rhizapodes in amebic dysentery, flagellates or mastigophores in flagellate dysentery, ciliates (balandium coli, infusoria) in ciliar dysentery, bacillus dysenteriae in bacillary dysentery, spirillum cholera asiatica in cholera, bacillus typhosus in typhoid fevers, gonococcus among the pedestrians with extensive lesion of the anal mucosa, plasmodium in bilious remittent fever] these causes produce diarrhoea." *Susruta* VI. 40. 2¹⁰⁷.

"Slow-moving (*ajava* = ascaris), agile (*vijava* = flagellates), creeping (*kipya* = trematodes or flukeworm), stealing (*tripya* = uncinariasis or hookworm), knotted-feet (*gandū-pada* = tenia), thread-like (*churu* = oxyuris vermicularis or thread-worm) and two mouthed (*dvimukha* = trichuris trichiura or whipworm) are the '*krimi*' (parasites) of the feces ; they are whitish and minute ; they move in the lower intestine and cause (bor-

107.

गुर्वतिश्चिरघबोच-द्रवस्थूलातिशीतलैः ।

विद्वद्वाप्यवनाजीर्णं विषमैश्चापि भोजनैः ॥

खेदाद्येरतियुक्तं च निष्यायुक्तं विषाद् भयात् ।

शोकाद्दुष्टान्मुनद्यातिपाणात् सात्त्विकं पुण्यं यात् ॥

जलाभिरमर्चं देव-विघातैः क्रिमिदोषतः ।

वृणां भवत्यतीसारी खचचं तस्य वच्यते ॥२॥

सुश्रुतसंहिता उपरतन्त्रम्, ४० ।

ing pain ; and among them there are some that have flagella *puchua* as in flagellates) and they are broad. These fecal '*krimi*' (worms and other microbic parasites) bring about colics, dyspepsia, jaundice, intestinal obstruction, weakness, overflowing of the watery discharges, heart lesion and non-formation of the feces."

Suśruta VI. 54. 4¹⁰⁰.

"The prodromes of diarrhoea are boring pains in the heart, umbilicus, coccygeal region, abdomen and the groin, lassitude of the body, flatulence, constipation, tympanites and indigestion." *Suśruta* VI. 40. 4¹⁰⁰.

"Abdominal pains, oliguria, sounds in the alimentary canal, prolapsus ani, lassitude of the

108.

अजवा विजवाः किय्यास्त्रिय्या गच्छ पदास्तथा ।

चुरवी विसृखायैव समै वैते पुरीषजाः ॥

अंताः सूक्षास्तुदन्ये ते गुदं प्रति सरन्ति च ।

तेषामेवापरे पुच्छैः प्रयवय भवन्ति हि ॥

गलाग्निमात्रापाश्च त्व-विट्त्ववत्सव'चयाः ।

प्रसेकावचिह्नद्रोम-विट्मेदास्तु पुरीषजैः ॥४

सुश्रुतसंहिता, उत्तरतन्त्रम्, ४० ।

109

हन्नाभिपाय दूरकुञ्चितोद-गामावसादानिहसन्निरोधाः ।

विट्सङ्ग आभ्रानमयाविपाकी भविष्यतस्तस्य पुरःसराणि ॥४

सुश्रुतसंहिता, उत्तरतन्त्रम्, ४० ।

groin, thigh and the knee and the evacuation of mucus-covered (*saphena* = frothy) dark-brownish, hardened scybala in small quantities with gas—these are the symptoms of nervous (dysenteric) diarrhœa.

“Dark-yellowish (in biliary obstruction), greenish (due to the presence of unchanged biliverdin in the discharges as in acute enteritis), or reddish (tarry stools may be due to cancer or ulcer of the intestine or dysentery), unformed, serous (like the juice of pressed meat), foul-smelling and steamy discharges rush forth in bilious diarrhœa (*cholera asiatica*); in this disease the patient becomes exhausted and becomes overpowered by polydipsia, vertigo and hyperemia of the internal organs.

“Whitish (rice-water, or containing undigested fat) and pasty stool appears noiselessly, mixed with mucus in phlegmatic diarrhœa; in this disease the patient suffers from collapse, somnolence, lassitude and repeated evacuations; and the patient becomes irritable and there is horripilation (contraction of the peripheral vessels).

“In the typhoid fevers, the above mentioned symptoms appear, but the color of the evacuation is varied and the patient suffers from polydipsia; it is very hard to cure and the prognosis is espec-

ally unfavorable for the infants and for the aged." *Suśruta* VI. 40. 5-8¹¹⁰

"If in cholera asiatica (*visūchikā*) and tymphenites (*alasaka*), the teeth (the gum), lips and nails become cyanotic, there is a comatose state, active vomiting, orbits of the eyes are sunk in the sockets, the voice becomes weak and the

110.

श्लेष्मिन्ः सक्तसूक्ष्मोऽनकृष्यो
 सक्षयानः सन्नक्तः स्रजङ्घः ।
 वर्धो मुखस्यस्यस्यं सफेनं
 रुचं श्लेष्मं सानिलं मादतेन ॥५॥
 दुर्गन्धुः स्रजङ्घं वेगवन्मांसतोय-
 ग्रन्थं भिन्नं स्निग्धदेहोऽतिरुचः ।
 पिपात् पीतं मोलमाखीकृतं वा
 तृष्णाभूच्छादादपाकज्वरार्तः ॥६॥
 तन्द्रानिद्रागीरवोत्कृष्टशसादी
 वेगाशब्दो स्रष्टविक्रोऽपि भूयः ।
 युक्तं सान्द्रं श्लेष्मणा श्लेष्मयुक्तं
 मक्तदेहो निःस्वनं हृष्टरोमा ॥७॥
 तन्द्रायुक्तो मोहमानास्ययोषो
 बन्धः कुर्यान्नैकवर्णं दृषारतः ।
 सन्धोऽतः सन्धिलिङ्गीपपत्तिः
 कृच्छ्रायं बालहृद्वेधसाध्यः ॥८॥

सुश्रुतस्य विद्वत्, उपरतवत्, ४० ।

joints become relaxed, then the prognosis is very unfavorable." *Suśruta* VI. 56. 8¹¹¹ .

"In acute diarrhœa, if the feces is formed or shows symptoms of being formed, and the vitality of the patient is not very low, there has not been much emaciation of flesh nor blood much thinned, appetite and digestion have returned, then the patient can be cured with difficulty. But if the patient has the following symptoms, notwithstanding the above-mentioned presentations, he is to be regarded as incurable. Incurable symptoms are being mentioned : if the stool has the color of concoction (dark-brownish), reddish, like that of the spleen and fat ; or is (in consistency) like water in which meat has been washed, curdled milk (semi-fluid), clarified butter, bone-marrow, oil, butter, milk, condensed milk, or deep bluish (with the development of indican in pronounced putrefaction), reddish, blackish (in bilious remittent or black-water fever), or transparent like water or the brownish-black color of the banana flowering-stem (clay or chocolate color stool appears in

111. वः श्वावद्वन्दीडनक्षोऽस्यसंश्रमहर्हिर्हि तोऽभ्यकरयातनेवः ।

आनखरः शर्मेविलुक्तसन्धिर्यावात्रः सोऽपुनरागमाय ॥८

सुनुतसंदिता, उभरतकन, ३६ ।

absence in *urobilin*, that is in the deficiency of the biliary secretion in the intestine), very fatty, pale-greenish or dark-greenish (due to unchanged biliverdin), or multi-colored; or is turbid, lubricous or mixed with thread-like substance (*oxyuris vermicularis* or thread-worms), mucus or like the ocellate spots on the tail-feather of a peacock (flakes); the odor is like that of a decomposed corpse (cadaverous), putrid, pyogenous or like raw fish (fishy); if the feces attracts quickly the flies, or various viscid substances are observed in it (the stool may contain undigested food, blood, mucus, pus, membranes, fat; calculi from the gall-bladder, intestines, stomach, salivary glands; intestinal parasites, exfoliated polypi and necrotic sloughs), or the discharge contains very little feces (a normal stool should have hard but flexible consistency, golden-brownish in color, cylindrical in form, nearly an inch in diameter, three to four inches in length; but if it is of small calibre, it is indicative of prolapsus ani or an annular stricture of the rectum; ribbon-shaped or flattened stool of stricture or cancer of the rectum; roundish masses of hardened feces (*scybalæ*) may shoot out in dysentery or is indicative of the gastric ulcer, gastric dilatation, cancer of the rectum or chronic constipa-

tion) or is free from it (*serous*) and the patient suffers from polydipsia, hyperemia of the internal colics or its insensibility to pain ; if there is anal fistula or ulceration, or hemorrhage of the pile or the pile does not go back to its own place, stricture of the anus, emaciation of the body, thinning of the blood (anemia due to the reduction of the red corpuscles), pain in the lumbar region, anorexia, morbid delirium and coma, or the diarrhoea suddenly ceases, that patient is to be regarded as incurable." *Charāka* VI. 19. 11¹¹²

"In the first stage of diarrhoea, fasting is beneficial. After fasting, for relief from diarrhoea barley water should be given with (astringent) concoction (*pāchana*). If patient still suffers

112. मङ्गलं प्रथितनामं शङ्खदपि वा पक्कमनतिक्षीयमांसशोणितबलो मन्दापि-
विहृतसुखरसश्च तादृशमातुरं कृच्छ्रसाध्यं विद्यात् । एभिर्वर्णैरतिसार्यमाणं शोषद्रव-
मातुरमसाध्योऽयमिति प्रत्याचक्षीत । तद्यथा—३. यशोभितामं यकृतपिच्छोपमं मेदो-
मांसोदकसदृशं दधिघृतमज्यतैलवसाक्षीर-वैश्वाराभमतिर्नाल-मतिरक्तमतिकृच्छ्रमुदकमि-
वाच्छं पुनर्मेककाभमतिस्निग्धं हरितामं नीलकषायवर्णं कर्ष्यं रवणं भाविलं पिच्छिलं
तन्मुमदामं चन्द्रकोपगतमतिकृष्णपपूतिपूयगम्याममत्स्यगन्धि मक्षिकाक्रान्तं कथितवह-
धातुस्त्रावमन्पुत्रीषमपुरीषं वातिसार्यमाणं दृष्ट्वादाहृज्वरभ्रमतमोहिक्ताश्वासानुबन्धमति-
वेदनमवेदनं वा सप्तपक्कगुदं पतितगुदबलिं सुक्तनालमतिक्षीयबलमांसशोणितं सर्व-
धर्मेभ्यश्च ग्लिनमरोचकारतिप्रलापसंभोहपरीतं सहस्रोपरतविकारमतिसारिरिदमचिकित्स्व
विद्यादिति सन्निपातातिसारः ।

चरकसंहिता, चिकित्सासूत्रम्, १८ ।

from colics and flatulence, give him an emetic with piper longum (which is carminative) and rock salt, dissolved in water. After vomiting light food can be given, barley water and piper longum. But if this does not relieve diarrhœa then every morning a concoction of turmeric (curcuma longum) or sweet flag (acorum calamum) should be given to drink." *Suśruta* VI. 40.16¹¹³.

"In morbid diarrhœa (dysentery) and strangury, a (rectal) enema (*vasti*=clyster) of concoction of liquorice root (*glycyrrhiza glabra*) and blue lotus (*nyphæa cærulea*) mixed with milk, clarified butter and honey (for irrigation) should be given; hemorrhagia proctica, æsus and fever are also relieved by this enema. If there is bloody stool an oily enema of soothing and honeyed herbs should be given daily either

113.

तत्र लङ्गनमीवादी पूर्व्वरूपेषु देहिनाम् ।

ततः पाचनसंयुक्तो यवाग्रादिक्लमो हितः ॥

अथवा वामयित्वा तु श्लाघाननिषेधितम् ।

पिप्पलीसंश्लेषाभिमिश्रणाद्यैरुपाकरोत् ॥

कार्यं च वसनस्थाने प्रायशो लघुभोजनम् ।

स्त्रुङ्गयु यवागृषु पिप्पल्याद्येव बीजयेत् ॥

अनेन विधिना चामं यस्य वै नीपशाम्यति ।

अरिद्रादिं वचादिं वा पिबेत् प्रातः स मानवः ॥१६॥

सुश्रुतसंहिता, उत्तरतन्त्रम्, ४०, १६ ।

at day or at night. An oily enema relieves the nervous irritation where it is administered ; and if the nerves are subdued, the dysentery is also cured." *Sūtrata* VI. 40. 90¹¹⁴.

Rectal irrigation with soothing oil or sterilizing medical solution or their combined emulsion is certainly one of the best means known to combat pernicious, ulcerated and resistant diarrhoea and is very effectively utilized in advanced modern treatment. Enemata serve to dislodge or to prevent fecal impaction where ulcers have healed and a stenosis has formed in the lower bowel, and for evacuating gas, putrefying matter, toxic discharges and other irritants within the rectum. An enema is generally given in constipation. And in an enema the fluid administered has to be limited to two to three quarts or it might cause distension, pain, ptosis

111.

महावने सूत्रज्ञे भिषग्भक्तिं प्रदापयेत् ।

पथोमधुघृतोन्मिश्रं मधुकोतपथसहितम् ॥

स भक्तिः शमयेत् तस्य रक्तं दाहमथो ज्वरम् ।

मधुरीषधसिद्धञ्च हितं तस्यानुवासनम् ।

रात्रावहृदि वा नित्यं राजातो यो भवेन्नरः ॥ १०

यथा यथा सतैः स्यात्तातशान्तिस्तथा तथा ।

प्रशान्ते मावते वापि शान्तिं अस्ति प्रवाहिका ॥

सुश्रुतसंहिता, उत्तरतन्त्रम्. ४०. १

or paresis of the intestine and in severe cases even the rupture of its membrane. While in irrigation, there is no limit to the quantity of fluid, for the solution is allowed to flow into and out of the gut through a double or return-flow tube (*irrigator*) or by making the fluid flow into the bowel by way of an artificial opening (*appendiceal or cecal*) and making it flow out at the anus through a proctoscope or a pipe introduced for the purpose, thus escaping as fast as the solution enters into the bowel. Therefore irrigation serves by the soothing and antiseptic properties of its content to heal the local ulcerated lesions, prevent the formation of impacted fecal masses, to wash out the sores and to neutralize the toxins, to remove toxins, irritating pus, blood, mucus, tissue debris and feces, to dislodge and wash away parasites, and to relieve enterospasm, colics and tenesmus. By *vasti* is meant to include the functions of an enema and irrigator according to the needs.

Improvement invariably follows *daily irrigation* of the intestine. But it is not so much due to the medicaments as to the dissolvent and cleansing quality of water and washing away the toxins, so that the organism does not suffer so much from their absorption. Undoubtedly

antiseptic, deodorant, soothing and stimulating medicaments exert beneficial influence, especially in inflammatory, ulcerative and obstructive lesions of the intestine, but they are only of secondary value. The only thing that is important is to irrigate the intestine as often as possible with body temperature of the solution. Positive good result is obtained by daily irrigation with warm saline solution, camomile, flax-seed, oak-bark tea, pinas canadensis (1 p. c.), borolyptol, potassium permanganate, glycothymolin or listerin (3 p. c.), salicylic acid, alum, zinc sulphate or silver nitrate (1 p. c.), boric acid or Carlsbad salt (2 p. c.) or thymol (1 : 2000). In advanced cases of deep-seated ulceration and erosions, it is better to use the above solutions a little stronger or ichthyol or balsam of Peru (2 to 5 p. c.), salicylate of soda (3 to 5 p. c.) and bisulphate of quinine (1 : 1000) especially in entamebic and bacillary dysentery. Oils named according to the degree of their proven usefulness, olive, sesame, sweet almond, cotton seed, liquid vaselin and neutralol, either alone or in emulsion with the above-mentioned medicaments, can be used with marked result.

Propylaxis : As water seems to be the principal source of infection of cholera asiatica,

typhoids and dysentery, and in water spirillum cholera asiatica, bacillus typhosus and pathogenic agents of dysentery (*entameba dysenteria*, *bacillus dysenteria*, *bālantidium coli*) can all live and thrive for a long time, it is essential that all drinking water must be thoroughly boiled and filtered. Milk also must be boiled before it is drunk, as it is often contaminated by water from suspicious sources. All dejecta from the victim of any of these diseases must be disinfected with a five per cent solution of carbolic acid, one per cent of chloride of lime or one-fortieth per cent of corrosive sublimate, so that all the pathogenic microbes be destroyed and they can not enter into the soil, especially if it be saturated with moisture where they can multiply, and retain their vitality and virulence for years. This also applies to urine and sputum. Nor should any vegetable or fruit be eaten raw or not thoroughly cooked which might have grown on the soil or fallen upon it, where there is the least possibility that the soil has been fertilized by human feces. And all coarse vegetables and unripe fruits which might leave a good deal of irritant residue, should be avoided. It is true that these germs have been found living in harmless, inert vegetative state without

provoking any lesion in the gastro-intestinal tract where they have been harboured, and the predisposing cause of their development is the malnutrition, fatigue, over-work and exhaustion of the organism. Yet it must be admitted that it is very dangerous to sustain such potential enemies.

In the treatment of *typhoid and choleraic diarrhœa*, there are two fundamentally opposed theories. One is the destruction and removal of the vibrios and to neutralize the toxins by a powerful antiseptic purgative like calomel (3 to 5 grains with 6 to 12 grains of sodium bicarbonate) and after this initial dose to administer small doses (one-tenth to one-twentieth grain), every half or quarter hour until the symptoms improve or the patient passes into algide stage. Some strongly recommend the administration of castor oil (half an ounce emulsified with chloroform) before giving calomel. And to inject saline solution (1.25 per cent solution of salt, prepared by dissolving 2 drachms of salt in one pint of water) at blood temperature, ten to fifteen ounces every half an hour to counteract the circulatory disturbance through the evacuations.

The other theory is to spare the vitality of

the patient which is seriously dissipated by repeated evacuations, and for this purpose a strong astringent like tannic acid (*kino*, *catechu*, *rhatania* are to be preferred to pure tannic acid) should be introduced into the rectum one to two litters daily in one per cent solution at a little above the body temperature. This seems to have shown good result. And if there are evidences of toxic accumulation and fecal retention, calomel is to be given every two hours in doses of 0.03 to 0.05 gram. The patient must be confined to bed. The body should be kept warm by fomentation. To quench thirst, sterilized water should be given, preferably acidulated with the juice of pomegranate, but any other fruit juice or milk under no circumstances. During convalescence pigeon, dove or chicken broth with rice, with aromatic but non-irritant spices is to be preferred, but all coarse and irritant food should be avoided.

In *puerperal diarrhœa* (*sutikā*) which is usually caused by the invasion of the blood by the streptococci, staphilococci, united with gonococci, coli bacilli and other micro-organisms through a wound of the uterus at child-birth or in miscarriage by careless, septic handling and spreading of the germs, treatment should be

more or less confined to increase the resisting power, bacteriolytic and agglutinative functions of the blood by dietary and hygienic regulations. The symptom-complex of septicemia (*sutikā*) commences usually within a week after infection. At the onset there is chilliness with low and moderate fever, but which rises and tends to become of continued type with decided daily remission. If however pyogenic germs have also got admission into the blood, the fever sets in with rigor, there is high temperature with steep curve and daily remission with sweating like malarial remittent fever. However, the fever runs an irregular course. But it may be complicated by previous or post malarial infection. As compared with septicemia, pyemia exhibits recurring chills, deeply remitting fever and sweats, rapid wasting and moderate icterus ; while in septicemia the chilliness is only felt at the onset of the fever which runs a mild, continuous type with no sweats and jaundice is much lighter. Headache, marked anorexia, nausea and diarrhoea are the usual symptoms of septicemia (*sutikā*). The pulse is rapid, small and compressible. The spleen may be palpably swollen ; petechial spots are not uncommon ; rashes or herps might also appear. Slight toxemic jaundice is also

usually seen. The urine usually contains albumin, leucocytes, red-cells and tube casts. The leucocytes are increased and there is an immense destruction of the red-corpuscles of the blood, leading often to hemoglobinemia and hemoglobinuria. Loss of appetite is very pronounced and there is no desire to partake of any kind of food and there is a special disgust to meat. The stool is emptied with severe tenesmus and consists of mucus mixed with blood. Often the joints become painful and swollen, and the skin of those parts roddish. Respiration is rapid but there is no dyspnea. But there may be complications of bronchitis or pneumonia.

Prognosis is not very favorable except in cases where within 6 to 8 weeks the temperature, respiration and pulse slowly tend to be normal. The treatment should chiefly consist of hygiene and dietary. The patient must be confined to bed. All movements should be restricted as much as possible, as movement tends to spread the infection. Even after convalescence has set in, the patient shall remain in bed, at least for four weeks and all physical motion and mental excitement should be forbidden. However it is very desirable that the room is airy, bright and cheerful, so that there is no oppressive dullness

and monotony. Food should be varied, easily digestible, appetizing and nutritious. However, all irritating spices must be avoided though aromatic and sweet-smelling substances can be added with advantage, with only exception to old wine which is very well tolerated in '*sutikā*'. Meat broth of pigeon, dove, chicken, tender goat or lamb (from lamb, fat should be taken out) is very useful in fighting this tragic malady which pitilessly transforms the long-dreamt happy motherhood into painful suffering and sad struggle for life. Lean, light fish can be given in any appetizing way, but fatty and heavy fish should be avoided.

Antistreptococcic serum which is calculated to destroy the bacteria either by producing agglutins or phagocytosis can be injected three times daily with promising result unless there is pyemia, in which case it is apt to do positive harm according to Menzer whose serum has good reputation for its efficacy. The inunction of unguentum is claimed by Crede to be beneficial. But none of these preparations have given completely satisfactory results. They are more or less empirical. The antipyretics are recommended by some.

But as fever is the expression of the bodily

reaction against the toxic products of the invading micro-organisms, suppression of fever is apt to do rather more harm than good unless absolutely necessary to reduce the temperature and relieve certain nervous symptoms. Moreover all the antipyretics—antipyrin, phenacetin, acetanilid, malakin, kryofene, lactophenin and others are all coal-tar products. And the use of these drugs is followed by depression and sometimes serious collapse. Therefore its repeated use in continued and prolonged fever might endanger the life of the patient by heart failure which is seriously damaged by this disease, though the temperature of fever is thereby reduced. Quinine of course in non-malarial septicemia, is hardly of any value. Only it is very useful when '*sutikā*' is complicated by malarial infection.

Prophylaxis in '*sutikā*' is the absolute aseptic handling at every child-birth, for otherwise with least wound or abrasion of the female genital organs which is inevitable, circulatory system may be invaded by pathogenic micro-organisms through lymph channel or veins. All the instruments must be thoroughly sterilized, and sterilized glove should be used. Genital organ also should be carefully examined before delivery

for any infectious disease, especially gonorrhea. In case of gonorrhea all precautions must be taken and the baby's eyes should be washed with one to two per cent silver-nitrate solution, or better still—Argyrol in 1-50 to 1-20 solution to prevent the affection of the eyes with its virus (*ophthalmia neonatorum*).

III-Diabetes.

“The causes, lesions and the organs that are affected which provoke temporary (alimentary) diabetes are as follows : too often an excessive consumption of various kinds of new cereals, bean-broths (of new *pisum sativum* and *phaseolus roxburghi*) seasoned with clarified butter, meat of animals and amphibious creatures, vegetable-leaves, sesame-seeds, rice or wheat cakes, rice-pudding, rice and lentil curry, puff-corn, sugar-cane-juice, milk, fermenting milk, fluid-food, sweet-meats and the intemperate eating of other products which are phlegmatic (reduces metabolism), fattening and diuretic—they are etiologic factors of diabetes (that is, the excessive consumption of carbohydrates in various forms above the assimilative power of the organism). Excessive liquid phlegma is the pathological production and abnormal accumulation of fat, flesh, per-

spiration, (production of) semen, blood, marrow, lymph, chyle and lecithin (*oja*) are the predisposing causes (become affected) " *Charaka* 11. 4. 311⁵.

There are various kinds of diabetes : "The urine is whitish, painless (micturition) and aquatic in '*udaka-meha*' [*diabetes ineipidus*, in which the quantity of urine is enormously increased (10 to 30 pints), it is light-pale in color and the specific gravity is low (1.002 to 1.007) ; the total urea output is slightly increased, but it does not contain albumin, sugar or casts ; only inosite (muscle-sugar) is met with on rare occasions. Except excessive thirst and loss of fluid, the patient otherwise might be in apparent good health. This disease is supposed to be of uervous origin] ; the urine is (sweetish) like the

115. तमेमे वयो निदानादिविशेषाः श्लेष्मनिमित्तानां प्रमेहाद्यानाम् अभिनिर्दि-
कार भवति, तद् यथा हायनकयककीनकीहासकर्मवधेत्कटसुकुन्दक-मरुज्जीहि-
प्रमोदकसुगन्धकानां नवाद्यानामतिवैद्यप्रतिप्रमायेभ्यो योपयोगः, तथा सपिंभता नवहरि-
मावस्यानां साम्यान्पीदकानाञ्च मांसानां शकतिलपल्लवपिट्ठाप्रपायसक्तशरद्विषीषोष-
विकाराणां शीरमन्दकदधिद्रवमधुरतद्व्यप्रायासानुपप्रयोगः, मृगान्यायामवर्ज्यं न, स्वप्न-
ग्रन्थानुग्रहप्रसङ्गो यः कश्चिद्विधिरन्योऽपि श्लेष्मदीदोसूतजननः स सर्वो निदानविशेषः ।
बहुद्रवः श्लेष्मा दोषविशेषो, बहुवद् मेदो मांसं शरीरजल्लेदः शुक्लं शोणितं वसा मज्जा
सर्वाका रसश्चैव इति संख्याता दूष्यविशेषाः ।

sugar-cane juice in '*ikṣu-meha*' (*diabetes mellitus* or glycosuria in which the urine contains one to ten per cent of glucose, is pale, acid and has a sweetish odor ; the quantity of urine is greatly increased (5 to 20 pints) and is usually of high specific gravity (1.030 to 1.045) ; urea is increased and in advanced stage of the disease acetone, diacetic and B-oxybutyric acid may be present. This disease is due to the lesion of the pancreas which seems to control the carbohydrate metabolism) ; the urine is like spirituous liquor in '*surā-meha*' [*acetonuria* in which a large amount of acetone is excreted with the urine, indicating incomplete oxidation of albumines and fats, especially in absence of carbohydrate which is needed for their complete combustion. Acetonuria is met with in inanition, typhoid fever, pneumonia, acute miliary tuberculosis, acute rheumatic fever, cancerous cachexia, intestinal auto-intoxication, septicemia and in diabetes, especially when sugar is completely withdrawn from diet for some time or sugar metabolism is disturbed. Acetone is a colorless mobile liquid of pleasant odor, produced commercially by the destructive distillation of acetates (whence the name '*pyroacetic spirit*'), and of sugar, cellulose and various organic compounds.

Acetone is the simplest representative of the aliphatic ketones and is known as 'demethyl-ketone'. It has some anesthetic quality and smells as ether. Pure alcohol when ingested in excess or under certain pathological condition of the alimentary canal passes with the urine (A. Ronchese: *L'analyse des urins*, p. 306); urination is painful and the urine contains sand-like minute but hard and angular crystals (uric acid sands) in 'sikatā-meha' (*gravel*—very small concretions, usually of uric acid, calcium oxalate or phosphates, are formed in the kidney and pass through ureter with the urine); repeated micturition of phlegmatic (colorless, jellylike) and viscous substance in *śanairmeha*' [*fibrinuria* in which a colorless sticky sediment (*coagulum*), or if much febrin is present, the conversion of the urine into a jellylike mass upon standing takes place. It is due to the presence of fibrinogen and a ferment capable of forming fibrin. It occurs in cases where the plasma of the blood enters some portion of the urinary tract, as in chyluria, croupous inflammation of the tract, villous growths in the bladder]; the urine is clear and saline in 'lavanameha' (*chlorides* are normally present in the urine and are daily excreted from 8 to 10 grams; but a persistent increase of 15 to 30

grams occurs in the prodromal stage of general paresis and diabetes insipidus, during convalescence from lobar pneumonia and post convulsive stage of epilepsy); there is horripilation (peripheral contraction) and the urine is whitish like thick rice-paste water (*albuminuria* occurs in acute nephritis, chronic parenchymatous nephritis and urethritis); the discharge is turbid and thick in 'sāndra-meha' (*gleet* in chronic urethritis causes a thin whitish discharge, but becomes, also, thick and yellowish under various causes. The origin of the discharge is the numerous mucous follicles, lining that portion of the urethra corresponding to the site of the chronic inflammation. When congested, granular or abraded patches exist, there is a constant hyper-secretion of mucus or muco-pus with exfoliation of the epithelium upon the surface of the lesion. In this condition the current of urine, as it passes over the diseased portion of the canal, rolls up into strings or threads the desquamated epithelium and muco-purulent deposit upon the surface and this appears in the urine as the delicate thready filament which is a familiar occurrence in chronic gonorrhea); the discharge is like the semen in 'śukra-meha' (*spermatorrhea* is indicative of self-abuse, excessive coitus, sexual neurasthenia

as cause or consequence, and prodrome of locomotor ataxia. Sedentary habits, an habitually loaded rectum, ascarides, and the too free use of condiments and liquors may be responsible for the slighter degree of the symptom. In a continent individual involuntary emissions during sleep, if occurring at intervals of 2 to 6 weeks, are quite normal. But if it be much more frequent and if the emissions occur without erection, unconsciously to the patient, in the day time or while straining at stool, their pathological character is marked. Spermatozoa are found in the first urine passed after emission in men. They occur also in some cases of injury or disease of the spinal cord. Occasionally a small amount of semen is expressed from the vesiculæ seminales by the pressure of hard fecal masses, during severe expulsive efforts accompanying obstinate constipation. The persistent presence of spermatozoa in the urine is symptomatic of spermatorrhea); scanty foamy urine in '*phenameha*' (in renal congestion, the urine is scanty, acid, of high specific gravity and usually cloudy with urates).

The urine is frothy, transparent and bluish (*indicanuria* in which indican is found in large

quantity. When albuminous substances undergo bacterial putrefaction in the intestine, or are rapidly decomposing in any part of the body, as in the putrid pus of septic peritonitis, or in empyema, indol is formed. When the indol is absorbed, it is oxidized, forming indoxyl, and the latter combines with the preformed potassium sulphate to become the conjugate potassium indoxyl-sulphate, or as it is more commonly termed '*indican*'. If indican which is itself colorless comes in contact with acids or oxidizing agents, it is decomposed with the formation of indigo blue. An excessive formation of indican is indicative of abnormal intestinal putrefaction. As a rule, it is usually associated with hypochloro-hydria, as hydrochloric acid exerts restraining influence on proteolytic bacteria. An excess of indican is found in gastric cancer and peritonitis); the micturition is painful and the urine has the color of turmeric (curcuma has yellowish-brown color) in '*haridrā-meha*' (*choluria* in which the urine is yellowish-brown or greenish-yellow due to the presence of bilirubin in the urine. It occurs in many diseases in which an excessive quantity of bile is excreted as bilious remittent fever and part of it appears unchanged in the urine); sour odor and sourish taste in '*amla-*

meha' (*oxaluria* in which there is a persistent excretion of oxalates. Normally oxalic acid is excreted daily from 0. 010 to 0. 020 gram (one-sixth to one-third grain), but exists in combination as calcium oxalate, and is held in solution by the acid sodium phosphate of the urine, and when the latter is deficient, the oxalates are precipitated. Oxalic acid is increased by certain foods, as cabbage, rhubarb, tomato, and to a lesser extent by asparagus, spinach, carrots, string beans and celery. Oxalic acid may also result from oxidation of uric acid or an incomplete oxidation of carbohydrates, in which case the intermediate product is oxaluric acid. A persistent increase in the excretion of oxalates is usually associated with the disorders of the gastro-intestinal tract or neurasthenia); the urine is like pressed alkaline water from (laundry) cloth, in smell, color, taste and touch in '*kṣāra-meha'* (*phosphaturia* in which a considerable amount of earthy phosphates mixed with fixed alkali is excreted with the urine. It is found in dyspepsia and neurasthenia. Occasionally the fixed alkali and the earthly phosphates deposit their sediments in the bladder, and the few whitish drops passed at the end of urination like semen, may be their symptomatic

expression. The urine is decidedly alkaline. Normally phosphoric acid is daily excreted from 2 to 3 grams (30 to 45 grains) in combination as alkaline and earthly phosphates, the alkaline salts predominating. It is derived from the food and partly from the decomposition of lecithin and nuclein. The excretion is greatly increased in leucemia, pernicious anemia, nervous dyspepsia and considerably diminished in intermittent malaria, pulmonary tuberculosis (with high temperature, typhoid, nephritis, chronic rheumatism and yellow atrophy of the liver); the urine is like the water of Indian madder (*mañjiṣṭhā* = *rubia munjista*, which has bright red color in '*mañjiṣṭhā-meha*' (*hemoglobinuria* in which the urine contains the blood-coloring matter '*hemoglobin*' and its oxidation product '*methemoglobin*'. Hemoglobinuria occurs in cases where there is such an extensive destruction of the erythrocytes that it exceeds the power of the hepatic activity to transform the whole of the liberated hemoglobin into bilirubin, and the excess escapes by way of the kidney with the urine. It is found in pernicious bilious remittent malarial fever, especially after excessive doses of quinine, syphilis, yellow fever and severe form of jaundice); and the urine is like the blood in

'*sonila-meha*' (*hematuria* in which the red-corpuscles of the blood appear in the urine. It occurs in cases where there is an acute congestion of the kidney and the number of erythrocytes indicates the severity of the lesion. Bloody urine may be voided in leucemia, hemophilia, purpura, and in renal cancer, tuberculosis, abscess and lithiasis).

The discharge is like clarified butter in '*sarpi-meha*' (*pyuria* in which the pus appears in the urine. It may be due to different causes, but often it is associated with the gonorrheal urethritis. The urine containing the pus from any renal lesion is usually acid and from the bladder alkaline); the urine is fatty in '*vasā-meha*' (*lipuria* in which the fat is present in the urine in such quantities as to enable its identification by the unaided eye. The fat may appear in the urine due to the ingestion of excessive amounts of fat (fat meat, or in cases of fracture involving the bone marrow and causing fat embolism, in long-continued suppurative processes, in the lipemia of diabetes mellitus, from the fatty degeneration of the renal epithelium in chronic nephritis, of pus cells, in pyonephrosis or neoplasm along the urinary tract, or in the fatty degeneration in phosphorus poisoning. If the urine is so crowded with minute fat globules as

to present a milky appearance to the naked eye, it is called '*chyluria*' or '*galacturia*'. Chyluria is usually due to parasitic origin, especially due to the presence of '*filaria, sanguinis hominis*'); the urine is in taste and color like honey-sugar (*kṣaudra* = fruit-sugar, that is levulose) in *kṣaudra-meha*' (*levulosuria* in which levulose appears in the urine. It seems that the pancreas does not regulate the metabolism of levulose, for when there is intolerance for dextrose as in glycosuria, a good deal of fruit sugar can be assimilated. Probably the liver synthesizes the fruit sugar and in the severe hepatic lesion or in the presence of toxins in the blood which causes irritation to the muscles, which possess a considerable power to utilize sugars, levulose is abnormally excreted with the urine, though its permeability through the kidney is nearly four times less than that of maltose); the urine flows like that of a mad elephant in '*hasti meha*' (*polyuria* or the diabetes insipidus in which 10 to 20 quarts of pale urine is discharged daily). *Suśruta* II. 6. 10¹¹⁶.

116. तत्र श्वेतमवेदनमुदकसदृशमुदकमेवो मेहति ; दधुरसतुल्यमिदमेवो, सुरामेवो सुरातुल्यं, खड्गं चिकताशुबिहं चिकतामेवो, ग्रनैः सकपं खट्वां ग्रनैर्मेवो, विशदं खवचतुल्यं खवचमेवो, दृष्टरोमा पिष्टरसतुल्यं पिष्टमेवो, आविलं सान्द्रं सान्द्रमेवो, दृक्कतुल्यं दृक्कमेवो, लोकां लोकां सफेनं फेनमेवो मेहति ॥१०

"Any one who repeatedly urinates ink-colored (blackish) warm urine, suffers from '*kāla-meha*' (*alkaptonuria* in which the urine darkens on standing, due to the presence of alkapton (glycosuric acid) or related oxyacids, or melanin from melanotic cancer; or in hemoglobinuria as in pernicious remittent bilious fever, due to the destruction of large amounts of erythrocytes, the blood-pigment may undergo change and appear in the urine as brownish-black or blackish, and for this reason the fever is called '*black-water-fever*')." Charaka II. 4. 17.¹¹⁷.

Prognosis: "If one has acquired diabetes mellitus (*madhu-meha*) by hereditary transmission, he is incurable. It is not only hereditary glycosuria that is incurable, but all hereditary

अत ऊर्ध्वं पित्तनिमित्तान् वक्ष्यामः । सफेनमण्डं नीलं नीलमेही मेहति ; सदाहं हरिद्राभं हरिद्रामेही, अक्षरसगन्धमक्कमेही, कृतचारप्रतिमं चारमेही, मञ्जिष्ठी-दकप्रकाशं मञ्जिष्ठामेही, शोणितप्रकाशं शोणितमेही मेहति ॥११॥

अत ऊर्ध्वं वातनिमित्तान् वक्ष्यामः । सर्पिःप्रकाशं सर्पिर्ण्मेही मेहति ; वसा-प्रकाशं वसामेही, चीद्वरसवर्णं चीद्वरमेही, मत्तमातत्रवदशुप्रवृद्धं हस्तिमेही मेहति ॥१२॥

सुश्रुतसंहिता, निदानस्थानम्., ६ ।

117. मसीवर्णं मज्जत्तं यो मूत्रमुष्णं प्रमेहति ।

पित्तस्य परिक्रोपेण तं विद्यात् कालमेहिजनम् ॥

अरकसंहिता, मूनिदानस्थान., ४ ।

predispositions are hard to remedy." *Charaka* VI. 6. 41¹¹⁰.

"As birds easily take shelter in low trees, so glycosuria rapidly attacks those who are addicted to gluttony, but averse to bathing and walking (physical exercise and exertion). Glycosuria proves fatal for one who lacks energy, is very fleshy, fat and extremely corpulent. He who eats only to cover his metabolic needs, recovers his health." *Charaka* II. 4. 32. ¹¹⁰.

"If the diabetes lasts for a long time, then there are complications of polydipsia, fever, diarrhoea, hyperaemia, weakness, anorexia, indigestion and putrefying boils, abscesses and gangrenes." *Charaka* II. 4. 30¹²⁰.

118. जातप्रमेही मधुमेहिनो वा

न साध्य उक्तः स हि बीजदोषात् ।

ये चापि केचित् कुलजा विकारा

भवन्ति तांश्च प्रबदन्त्यसाध्यान् ॥ चरकसंहिता, चिकित्सास्थानम्, ६, ४१ ।

119. मृदुमध्यवह्नायै तु ज्ञानं चक्रमथविभम् ।

प्रमेहः क्षिप्रमभ्येति नीचद्रुमनिवाहजः ॥

मन्दोत्साहमतिस्थूलमतिस्त्रिधं महाशयनम् ।

वृत्त्युः प्रमेहरूपेण क्षिप्रमादाय गच्छति ॥

यस्माद्धारं शरीरस्य धातुसाम्यकारं नरः ।

सेवते विविधाशान्धाश्चेष्टाः स सुखमश्नुते ॥

चरकसंहिता, निदानस्थानम्, ४ ।

120. उपद्रवास्तु खलु प्रमेहिनां दृष्टान्तरातिसारदाहदीर्घव्यारोचनाविपाकाः.
पुतिमांसपिण्डकालजीविद्रव्यादयश्च तत्प्रसङ्गाद् भवन्ति ।

चरकसंहिता, निदानस्थानम्, ४ ।

"If a diabetic has boils then an expert surgeon shall treat him by cleaning and restoring (*cicatrizing*) them by his instruments. *Charaka* VI. 6. 42¹²¹.

Prophylaxis: In diabetes mellitus, it is necessary to know whether the disease is acquired or inherited. In lesions affecting the pons medulla, cerebellum, liver, thyroid and especially the pancreas, diabetes may be provoked. But in other diseases which do not seriously damage the pancreas, as in syphilis, acute infection, traumatic and surgical neurasthenia, physical and mental excesses, there usually exists a predisposing cause. The predisposing cause consists of metabolic deficiency of assimilating carbohydrates. It might lie in some inherent weakness of the hepatic and principally the pancreatic cells or that of the organism to burn the carbohydrates or that of the nervous mechanism controlling the process. *Susruta* did not fail to distinguish them. He says :

121.

प्रमेहिण्यां याः पिङ्गवा मयोक्ताः

रोगाधिकारे ह्यग्नेर्न सप्त ।

ताः मल्यविद्धिः कुश्लैश्चिकित्साः

शक्ने च संशोधनरीपण्ये च ॥

चरकसंहिता, चिकित्सास्थानम्, ६, ४२ ।

"Diabetes is either inherited or acquired (alimentary). Inherited diabetes is due to improper dietary. The hereditary diabetic is very lean, dry (skin), has weak appetite (*anorexia*), polydipsia and is very nervous; the alimentary diabetic is fleshy, has voracious appetite (*bulimia*), adiposis and is addicted to sedentary habits (fond of bed, seat and sleep. The lean diabetic should be treated by dietetic regulation, and the fat diabetic by '*apatarpana*' (exercise and fasting). *Susruta* IV. 11. 2¹²².

Prophylaxis should begin with children, especially when children of hereditarily predisposed parents are found with tendencies to neurosis, gout or obesity, and they should not intermarry with families of the same diathesis, nor over-indulge in sugars or excess of carbohydrates. Adults with hereditary tendencies should avoid taking sugar and should not exceed in the carbohydrate diet beyond the physiologic

122. वी प्रमेही रुद्धजोऽप्यनिमित्तश्च भवतः । तत्र रुद्धजो मादपिदबीज-
दोषकृतः । अहिताहारजोऽप्यनिमित्तः । तयोः पूर्वोच्यते तः कस्य रुद्धोऽस्यासौ
पिपासुर्भूयं परितरयशोऽस्य भवति । उत्तरेषु स्थूलो बद्धासौ क्षिण्वः शय्यासनक्षप्रशीलः
प्रायेयेति । तत्र कश्चनद्रोणप्रतिषङ्गताभिः क्रियाभिश्चिकित्सित, स्थूलमतपश्च-
युक्ताभिः ॥९

सुश्रुतसंहिता चिकित्सितस्थानम्, ११ ।

and metabolic needs. Rather it would be wise to partly replace the carbohydrates with fat and protein. Tendency to obesity should be combatted by regular exercise and frugal diet. When obesity has developed, it should be reduced by a slow process of moderate daily outdoor exercise and a slight undernutrition, especially in carbohydrates and fat.

Treatment : Glycosuria can be successfully fought only by rational dietary. It is a safe policy in the beginning of the treatment to eliminate all carbohydrates from the diet. It may be said against this, that the excretion of sugar in the urine is but a symptom of the lesion, and the elimination of the sugar can not remedy the cause of the lesion, and moreover even in a sugar-free diet, sugar is synthetically prepared and excreted out of the protein and fat molecules. This may be all true, but the clinical experience shows that in a sugar-free diet, the patient soon develops carbohydrate tolerance. And the presence of an excessive quantity of sugar in the circulation and tissues which can not be metabolized, causes various pathological changes and manifestations. Von Noorden finds the use of oatmeal gruel once a week proves very beneficial. But on the oatmeal day he forbids the

use of any protein, even not egg or milk. Only a little butter is permitted. And the day before the oatmeal diet, he gives only vegetables and fat. Levine finds that potato is just as efficacious as the oatmeal. Fruits containing minimum of glucose like the lemon and orange can be given, as there is certain tolerance for levulose. The alternating constipation and diarrhoea which is symptomatic of diabetes due to gastro-intestinal disorders, should be remedied by laxative and constipative food according to the needs. Strong purgatives should be avoided. If this is not sufficient, in constipation Carlsbad or Epsom salts can be given and in diarrhoea irrigation should be applied. Special attention should be given to the cleanliness of the skin as many skin lesions are apt to take place in glycosuria. Mild antiseptic neutral soaps, containing tar, boric acid or eucalyptus have proved beneficial. When an infective process has already begun, great care should be taken that the surrounding tissues or other parts do not become infected and for local use, iodoform, iodol or aristol can be used with advantage.

Diabetes insipidus : The pathology of this disease is not yet well understood. It occurs in cases where there is lesion in the pons,

medulla or the cerebellum. It may be caused by many diseases, but syphilis is the principal cause. And in that case its principal remedy is antisyphilitic treatment.

IV.—Diseases of the Bladder.

“There are twelve kinds of lesions of the bladder as follows :—annular swelling (*vāta-kunḍalikā*=*pericystis*), hard globular tumor (*mūtraṣṭhīlā*=*myoma*), swelling of the mouth of the bladder (*vātavasti*=*prostatic hypertrophy*), difficult and scanty repeated urination (*mūtrātīta*=*vesical tenesmus*), abdominal bladder (*mūtra-jāṭhara*=*over-distension and hypertrophy of the bladder with contraction and obstruction of the cavity*), obstruction to the passage of urine (*mūtrotsaṅga*=*urethritis*), uremia (*mūtra-kṣaya*), fibroma (*mūtra-granthi*), spermatorrhea (*mūtra-sukra*), cystitis (*uṣṇa-vāta*) and gangrenous or suppurative cystitis (*mūtraukasāda*).

“If the urine is concentrated and is not evacuated (in time), the humor ‘*vāyu*’ becomes vitiated and it circulates at the mouth in circular form (that is causes annular inflammation). This causes much pain and there is repeated painful scanty micturition. This difficult disease

is known as '*vāta-kunḍalikā* (*pericystitis*, which implies inflammation of the tunica advenitia of the bladder. Inflammation of the bladder (*cystitis*) may be provoked by various causes as follows : (a) Cystitis may occur during the course of many acute infectious diseases as acute articular rheumatism, typhoid fever, small-pox, measles, influenza, cholera, diphtheria. This complication may set in during the height of the disease, or may appear during convalescence. Toward its cause, a number of factors probably contribute. The chemical constituents of the urine are often profoundly altered : the urine is concentrated ; it contains abnormal substances of disturbed metabolism which are more or less irritant and moreover may contain the pathogenic germs of specific infections. The tissues of the bladder are deprived of proper nutrition and lack their full power of resistance. (b) In constitutional diseases as gout and diabetes in which the urine is irritant. (c) In general septicemia as pyemia or internal suppuration of any organ in which the suppuration foci may be brought to the bladder. (d) From irritating food and drink as excessive consumption of strong and irritant pepper and alcoholic drinks. (e) Infections from the adjacent organs as the kidney and the

urethra. The bladder may be affected by the kidney either directly by the urine, or by the lymph channel or by contiguity of the tissues. Urethritis is a common cause of which gonorrhea is an important factor. In acute gonorrhea the passage of gonococci is favored through spincter vesicae in its ascent during vesical congestion under sexual excitement or under the stimulation of alcohol or irritating spicy food. Chronic prostatic hypertrophy is also often a causative factor of the congestion of the base of the bladder. The cystites are of two kinds—simple aseptic and septic. The simple aseptic inflammation may be provoked by the irritating substances in the urine, metabolic or ingested, by the disturbances in the function of micturition or by the disturbances in the circulation incident to vascular or nervous conditions. It is well known that ammonia, oxalates, urates and sugar, if they are concentrated in the urine are active irritants of the bladder. And the primary role of the irritants can be ascribed to the uric acid sands and calculi. They by their mechanical irritation cause congestion and inflammation and if the pathogenic germs are present, ulcerous gangrenes. Disturbances in the functions of the urine

cause more or less hyperemia and inflammation. Over-distension of the bladder either voluntary or pathological, the too frequent and too forceful contractions in the act of urination bring about this condition. When the causes of the over-distension, retention and obstruction are organic, septic infection takes place. Various micro-organisms have been found to be related with the suppurative process as the staphylococcus pyogenes aureus, albus and citreus which can decompose urea, streptococcus pyogenes, bacterium coli, proteus vulgaris (which possesses the power of decomposing urea with the production of ammoniacal reaction), gonococcus and tubercle bacillus.

“Unusual frequency of micturition is present in all cases, except in the beginning and in mild cases when the urine remains acid. The causes of frequency are threefold, The reflex influences of an inflammation of the vesical mucous membrane are alone able to provoke frequent urination. In an analogous manner, the irritation of ammoniacal urine and of precipitated salts effects contraction of the organ. In cases of obstruction, the partial retention of the irritant urine powerfully excites the detrusors. Thus the condition of the frequent micturition is usually worse in the

contracted bladder of prostatic obstruction. In calculous cystitis, violent movement usually aggravates the condition. Tenesmus is frequently present. In some cases it becomes so exaggerated and remains almost constant, that the patient in order to get relief from the exasperating pain, constantly attempts to urinate, to force a few drops, though the bladder may be almost empty).

“*Vāyu*’ causes in the intermediate region of the lower intestine and the bladder, a hard, immovable and tough tumor. This causes the obstruction of the passage of the feces, urine and intestinal gas. This provokes tympanitis and pain. This (disease) is known as ‘*vātāṣṭhīlā*’ (*myoma* is usually a hard interstitial tumor, producing a globular induration of the bladder wall. It is generally located at the orifice of the bladder, and it has been noted from the size of a cherry up to such dimension as fill half of the cavity. The tumor is divided into lobules by connective tissue; its main bulk is composed of unstriped muscle-cells, in some places arranged in fasciculi, in others irregularly grouped).

“In any one who retains urine, the ‘*vāyu*’ of the bladder becomes vitiated and closes the mouth of

the bladder, and consequently the urine is obstructed. And this vitiated 'vāyu' remains in the bladder and the prostrate (*kukṣi* = groin) as an oppressor (in intumescence). This disease is very hard to cure and it is called 'vāta-vasti' (*obstructive hypertrophy of the prostate* which may range in size from an orange to that of a cocoanut. The hypertrophy may be general, affecting the whole organ symmetrically or the enlargement is confined within the capsule of the gland and may extend a considerable distance, pushing the capsule and remain only connected with the prostate by a glandular and fibrous tissue. As the internal spincter may be considered as an integral part of the prostate, hence any alteration of the structure of the latter would be followed by the interference of the function of the former. In addition, as the prostate is limited in front and below by dense fascia, it tends to grow upward and backward as it hypertrophies, elongating and narrowing or deflecting the urethra, according to whether the enlargement is symmetrical or irregular, but always raising the vesical outlet to a higher level than normal. The urine therefore left after each micturition (residual urine) settles at the bottom, causing the formation of calculi by precipitation

and sedimentation of the mineral constituents. And an early effect of the prostatic hypertrophy is congestion and later inflammation of that portion of the mucous membrane of the bladder in contact with the tumor. The inflammation spreads in time, aggravated by the sluggish venous return. And as the passage of the urine is reduced, the bladder can only be incompletely evacuated and a small quantity at a time by 'slow dribbling from the distended bladder. And in this condition, the mucous membrane offers but slight resistance to microbic invasion).

"If for a long time the urine is retained, then when an attempt is made for its evacuation, there is no micturition, or it appears but slightly. If strained, the urine appears with slight pain and in small quantities. This disease is caused by the suppression of the urine, and is called '*mūtrā-tīta*' (*vesical tenesmus*).

"If the urine is suppressed, it causes distension ; distension vitiates '*vāyu*' and provokes painful tympanites. This is called '*mūtra-jāṭhara*' and this disease contracts the downward channel (*hypertrophy of the bladder with contraction of the cavity and obstruction of the passage*).

"In the disease in which the flow of the urine is interfered with either at the neck of the urethra

or near the glans penis, or under tenesmus bloody urine appears with pain, or without pain it dribbles little by little, this is known as '*mūtrotsaṅga*' (*urethritis*). This disease is caused by a qualified (special) '*vāyu*'.

"In an emaciated and tired body, '*pitta*' and '*vāyu*' absorb the urine. It causes hyperemia and pain. This disease is called '*mūtrakṣaya*' (*uremia*) This is very troublesome. (Uremia occurs in the course of acute or chronic nephritis, puerperal eclampsia, some cases of obstructed renal calculus, and occasionally in patients with pronounced vascular changes. The symptoms are general malaise, nausea, vomiting, insomnia, amaurosis, mania, delirium, dyspnea, increased arterial tension. In complete uremia, the patient lives about 10 to 12 days).

"The tiny, globular and firm tumor that is formed at the interior part of the neck of the bladder, is called '*mūtra-granthi*' (*fibroma* generally occurs in the adult and is usually located single upon the base and trigonum. The size is like that of a nut. It may be sessile or pediculated, hard or soft. The surface is lobulated and covered with normal or inflamed mucous membrane, which may or not be firmly attached to the growth. On section the tumor is white

and glistening, and there may be patches of myxomatous or areas of calcification). This tumor is painful, nonulcerative and narrows the mouth of the bladder. It resembles pain like that of calculus.

"If any one indulges in sexual intercourse with full bladder, then the semen is displaced and becomes mixed with urine, and pale watery semen appears just before urination or after it. It is called '*mūtra-śukra*' (*prostatorrhœa*);

"'*Pitta*' becomes vitiated in heavy exercise, long journey or exposure to the sun, and mixed with the '*vāyu*' brings about the inflammation of the bladder, urethra and the pelvic region (sympathetic) and causes discharge. In this yellowish, slightly reddish (pinkish) or pure reddish urine is excreted with tenesmus. This disease is called by the specialists as '*uṣṇa-vāta*' (in non-suppurative *cystitis*, the urine is pale yellow, or according to the extent of bleeding, the color will vary from the faintest pink to a deep dark-red).

"The disease in which the urine is excreted with burning sensation, is turbid, dark-brownish and concentrated, and if dried (by the sun or evaporated), leaves a residue like powdered granite, is called the bilious '*mūtraukasāda*'.

(*suppurative cystitis*, in which the urine is turbid, containing tenacious flocculi of altered pus and there is a large amount of precipitated salts and detritus. On standing, a heavy sediment forms, but the supernatant urine does not become clear. The crystalline sediment consists of a moderate amount of amorphous phosphates, amorphous ammonium urates and large quantities of triple phosphates. The crystals of ammonium urate are dark balls which may be spiculated; the triple phosphate commonly appears in the form of slab-shaped crystals; there may however, be needles, squares and many forms of irregular crystallization). The disease in which the urine is whitish, concentrated and appears with tenesmus, and when dried, it is pale-colored like the conch-shell powder and is slimy, is to be known as phlegmatic '*mūtra-kasāda*' (*cystitis* and tumor of the bladder in which the urine is pale-whitish, opalescent, with a heavy deposit of pus, phosphates and detritus. It is alkaline in reaction. The benign tumors are in themselves quite compatible with long life: in several carefully observed subjects, they existed, ten, twenty or more years. The course of papilloma is largely determined by the hemorrhage and the complications. The malignant

tumors are usually fatal within one or two years, particularly of the base or the neck. The fatality of the disease of course depends upon the site affected, the variety of growth present, the clinical course, and complications of cystitis and nephritis. The causes of death are indirect. Rarely profuse hemorrhage has been the direct cause. In the cachectic debility which follows prolonged hemorrhage, the system becomes vulnerable, and any intercurrent disease may prove fatal). "*Charaka* VI. 58, 2-13¹²³.

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वातकुच्छिकाडीक्षा वातवसिक्कावैच च ।

मूमातीतः सवठरो मूमीत्सङ्गः चवकाचा ॥

मूमीकसादी धी चापि रोगा दादश्च कीर्तिताः ॥ ३

रीचकाचे मविधातादा वायुवैसी सवेदनम् ।

मूलं संगृह्य चरति विगुणः कुच्छलीकृतः ॥

सुजेदस्यात्यमववा सकलस्तं शनेः शनेः ।

वातकुच्छिकां तान् व्याधिं विद्यात् सुवाचकम् ॥ १

शक्नोन्मार्गस्य वक्षेच्च वायुरन्तरमाश्रितः ।

अडीक्षादधनं यन्त्रिं करोत्यपसप्तसप्तम् ॥

विष्णुर्मानिससङ्गश्च तवाधामश्च वायते ।

वेदना वायते वसी वाताडीक्षेति तां विदुः ॥ ४

वेगं विधारयेद्यस्तु मूलस्याकुच्छको नरः ।

निरुच्छिं मुखं तस्य वक्षेर्वसिगतोऽग्निः ।

मूलसङ्गी भवेत् तेन वसिक्कुचिनिषीदितः ।

वातवसिः स विद्वेदो व्याधिः कृच्छ्रमहादनः ॥ ५

"In these thirteen kinds of urinary troubles use remedial medicines which will relieve strangury. In all these lesions bougie and irrigations are applicable.

The cylinder of the bougie is to be made of

वेगं सन्धार्य मूत्रस्य बो ध्रुयः कटुनिष्कृति ।
 तस्य नाभ्येति यदि वा कचक्षित् संप्रवर्तते ॥
 प्रवाहती मन्दबलमल्पमस्य पुनः पुनः ।
 मूत्रातीतान् तं विद्यामूत्रवेगविधातजम् ॥ ६
 मूत्रस्य विहृते वेगे तद्दुहावर्तयेत्तुना ।
 अपातः कुपितो वायुबद्धं पूरयेद्भूषणम् ।
 नासिरक्षसादाधानं जनयेत् तीव्रवेदनम् ।
 तं मूत्रजठरं विद्यादधःकोतोनिरोधकम् ॥ ७
 बली वाय्वज्जवा नासि मली वा बलं देहिमः ।
 मूत्रं प्रहरं सन्धे त सरत्तं वा प्रवाहतः ।
 सवेच्छनेरक्षमस्यं सखं वाच नीबजम् ।
 विद्युत्तानिषजो व्याधिर्मुत्तीतसक्तः स सञ्चितः ॥ ८
 बचस्य ज्ञानदेहस्य बलिस्त्री पित्तमाहती ।
 सदाहवेदनं ज्ञप्त्वां मूत्रसंशयम् ॥ ९
 अभ्यन्तरे बलिमुखे ज्ञप्तोऽस्यः स्थिर एव च ।
 वेदनाबाननिष्कन्दी मूत्रमार्गनिरोधनः ।
 जायते सङ्घसा यस्य सन्धिरश्मरिषस्यचः
 स मूत्रसन्धिरिष्येयमुच्यते वेदनादिभिः ॥ १०
 मृदुपक्वितमूत्रान्ते नै पुनं बोऽभिनिन्दति ।
 तस्य मूत्रयुतं रेतः सङ्घसा संप्रवर्तते ॥

gold or silver. The aperture of the cylinder made of gold should be like that of the jasmine flower stem, and that of the silver like a mustard seed. It should have the shape like a cow's tail (slightly curved and graduated in dimension), with two rings (so that it can not be pushed farther than is necessary, or it might wound the bladder) and twelve digits long." *Charaka VIII. 9. 28-29*¹²⁴.

पुरसावापि सूतस्य पचावापि कदाचन ।
 भक्षोदकप्रतीक्षां सूतयुक्तं तदुच्यते ॥ ११
 व्यावामाभ्यातपैः पित्तं वस्तिं प्राप्यानिष्ठावृतम् ।
 वस्तिमिदं गुदं च प्रदहन् नावयेदधः ॥
 सूतं हारिद्रमथवा सरक्तं रक्तमेव वा ।
 कृच्छात् प्रवर्त्तते जलोदकवातं वदन्ति तम् ॥ १२
 विषदं पीतचं सूतं सदाचं वदन्तं तथा ।
 सूतं भवति यथापि रोचनाचूर्णसन्निभम् ।
 सूतीकसादं तं विद्याद्भिन्नं पित्तजतं दुधः ॥
 सूतं भवति यथापि मन्थचूर्णप्रपाच्युरम् ।
 पिच्छिलं संहतं चैतं तथा कृच्छं प्रवर्त्तते ।
 सूतीकसादं तं विद्यादानवचापरं कफान् ॥ १३

सुमुतसंहिता, उत्तरतन्त्रम्, ५८ ।

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दीवाधिकमवेधे तान् सूतकण्डूहरैर्जयेत् ।
 वस्तिमुत्तरवस्तिश्च सर्व्वं वामिव योजयेत् ॥
 पुष्पमेवम्बु कैमं स्नान् सूतमीत्तरवस्तिवम् ।
 जालीपुष्पक इत्येव समं गोपुच्छसंस्मितम् ॥
 रीप्यं वा सर्व्वपिच्छिद्रं विकचं वादद्याद्गुचम् ॥

चरकसंहिता, सिद्धिस्थानम्, ८ ।

The underlying principles in the treatment of acute or chronic cystitis are (a) to render the urine bland and slightly antiseptic; (b) to put the bladder at rest and to relieve pain; (c) to lessen pelvic congestion. With healthy kidney and in non-suppurating cystitis of the bladder, the urine may be made bland by drinking a good deal of whey or butter-milk or plenty of pure water. Hot baths, particularly hot sitz-baths are revulsive and counter-irritant. They relieve pain and congestion. To relieve congestion leeches may also be applied to the peritoneum and above the pubis. To make the urine slightly antiseptic, salol can be administered three times a day, in small doses of five grains.

But in chronic cystitis, irrigation is the best curative means known. Irrigation removes mechanically decomposing discharges, diminishes the quantity of pus and mucus, renders the urine bland and unirritating, lessens the severity of the inflammation, lessens further fermentation and decomposition, and exerts a stimulating and healing influence upon the diseased membrane. The main symptoms of cystitis, frequency, urgency, tenesmus and strangury are chiefly dependent upon inflammation located

about the vesical neck. Though irrigation can not disinfect the entire diseased and suppurating tissues, this part can be easily reached, and the healing influence of a disinfectant and soothing lotion can be easily exerted on it. This can be accomplished by irrigations, instillations or drainage, or all these combined. For irrigation, a weak, non-irritating, antiseptic solution is preferable as silver nitrate 1: 5000 to 500, potassium permanganate 1: 5000 to 2000, carbolic acid 1: 500, boric acid 1: 50, normal saline solution 0. 7 per cent. Irrigation is only recommended when the patient urinates easily and empties his bladder completely. But bladder should not be distended to the point of causing pain and spasm. Usually one daily irrigation is sufficient, but in severe cases, it can be repeated. When urination is extremely painful, irrigation can be done by a soft catheter. The catheter is attached to a fountain syringe. The lotion is allowed to flow through, and while it is flowing, the catheter is slowly passed into the bladder. Three to five ounces are injected and the tube leading to the fountain syringe is discontinued, and the injection is allowed to flow out.

Instillations are applied by means of an

instillator, which is a silver or hard rubber cylindrical catheter about 18 Fr. caliber, provided with a fine canal. To the end of the shaft of the catheter is fitted a hypodermic syringe with a capacity for forty minims and is filled with a choice lotion, silver nitrate 1 to 5 per cent in gonorrheal cystitis, iodoform emulsion in tubercular cases with ten per cent glycerine. The catheter is lubricated with glycerin or boroglyceride, and is introduced into the urethra until its tip is within the grasp of the compressor urethrae muscle. The piston of the syringe is then driven down, causing the injection to flow along the membranous and prostatic urethra into the bladder.

The simplest and the safest form of drainage is that by continuous catheterization. A soft catheter of medium caliber should be selected. Important points to observe are that the eye of the catheter lies just within the bladder and that the instrument thoroughly and continually drains this viscus. To determine the eye of the catheter in relation to the neck of the bladder, the instrument is introduced and the bladder is emptied. Four to six ounces of boric acid solution are then injected, and the catheter is withdrawn until the fluid ceases to flow. It

is then passed in until the fluid begins to flow, and is held in this position until the bladder is empty. This continuous catheterization may be kept up from one to three weeks. It usually causes a mild traumatic urethritis. This is treated by withdrawing the catheter slightly at each irrigation until its end lies without the compressor urathræ muscle. By forcing an antiseptic solution into the catheter, it will then flash out the entire anterior urethra. In case of intense pain, suprapubic drainage can be also performed with advantage.

The method adopted by the Charaka School is as follows :—

“The patient after his bath, shall take meat broth or milk. And he shall be seated on a soft, easy and comfortable cushion, after he has evacuated his bladder when there is natural call. Then his penis should be massaged with ointment. After that a sound (*śalākā*) should be introduced for the urethral exploration. If the sound passes without any obstruction, then it should be withdrawn, and the eye of the bougie introduced. All the regulations recommended for anal irrigation (*enema*) are to be observed. If the lotion is allowed to flow at great speed, it causes inflammation of the base,

and if it be not sufficient, it does not spread all over the surface, so with a steady hand (not trembling), the bougie is to be introduced and withdrawn." *Charaka* VII. 9.3¹¹.

Prodrome of lithiasis : "Bladder-irritability, anorexia, strangury, lacerating pain at the neck of the bladder, scrotum and the urethra, fever, lassitude, and the goat-smell of the urine are the prodromes of lithiasis. Moreover, before the calculus formation, the color of the urine becomes unnatural and micturition is painful. The urine is concentrated and cloudy (with urates). The urine becomes corrupt with 'vāyu' (ammoniacal decomposition).

Symptoms :—With the calculi formation, there are pains in the umbiculus, bladder, scrotum,

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जातस्य मुक्तभक्तस्य रसिन् पयसापि वा ।
 सृष्टविषं सूत्रविनस्य पीठे जातुसमी वदी ॥
 अजीः सुखोपविष्टस्य हृष्टे मीडे हृतान्विते ।
 अस्वाकसान्विष्य गतिं यद्यप्रतिष्ठता व्रजेत् ॥
 ततः शिक्वाः प्रसादिन पुचनेनं प्रवेद्येत् ।
 गुदवन्धूनामोश्च प्रचवेदसु सेवनीम् ॥
 हिंसाहतिनतं वसिष्ठेन खेडो न गच्छति ।
 सुखं प्रपीद्य निष्कम्पं निष्कर्वेत्ते प्रवेद्य च ॥

अरक्तसंज्ञिता, सिद्धिज्ञापन ८ ।

urethra and their adjacent regions at the time of micturition, sudden interference with the flow of the urinal stream (by the spasmodic closing of the voluntary muscles when a small stone is forced into the vesical orifice), bloody urine (the blood is invariably present in the vesical calculus, though the hemorrhage from the bladder is never profuse ; the quantity of blood and the degree of pain depends on the nature of ulcerated surface and the contour of the stone), splashing urine, the color of the urine like that of a gem (reddish), clear urine containing sand (uric acid crystals) and pain is much increased by running, jumping, riding and long journeys (violent movements are apt to cause friction of the stone with the vesical surface)." *Susruta* II. 3. 4-6¹²⁶

126. तासां पूर्वोक्तानि वक्षिणीकारोचकौ मूलजम् वक्षिणीरोक्तश्लेष्मतां वेदना
लज्जा व्यावसादी वक्षनम्बिलं मूलस्येति ॥ ४

वक्षसं वेदनावर्चं दुष्टं चान्द्रमवाविलम् ।

पुर्वोक्तोऽयमनः लज्जाम्बुं लज्जति मानवः ॥ ५

अथ आतासु नामिवक्षिणीवर्णनैश्चनेचनतमजिन् मेहतो वेदना मूलधारालम्बः
वक्षिरसुता मूलविक्षिण्यच गोमेदकप्रकाशमनाविष्टं सक्षिकर्तं विलुजति धावनसङ्कल-
नवनसङ्कलानाधमनैश्चा वेदना भवति ॥ ६

सुप्तसंक्षिता, निदानस्थानम्, २ ।

“As gallstone is formed in a cow by desiccation of the bile, so calculus is formed. *Calculi* are formed in various shapes like that of the flower of ‘*nuclea cadamba*’ (the oxalate-of-lime calculus is the hardest, often orange-dark in color, more or less spherical in form and studded with nodules, whence it derives its name as mulberry calculus); like stone (finely laminated stones are often found among the vesical calculi, with alternate layers of distinctly crystalline oxalates and urates ; the urates are yellow-reddish in color) ; smooth (pure uric-acid stones are the softest, are yellow, red or brown in color and generally present a smooth surface); like pea (*custin*) or soft (amorphous phosphates). If the calculus is pushed against the vesical orifice, then the passage of urine is obstructed, and it provokes great pain (the stone is grasped and forced against the sensitive neck either by the flow of urine or in violent motion as jolting over a rough road or riding). This exasperates the patient and he makes repeated attempts to urination. There is defecation with tremor. There is lancinating pain in the scrotum, urethra and the bladder, and if the urethra is wounded, the urine comes mixed with blood. But when the calculus is dislodged from the

vesical neck, the urine again flows with ease. If the calculus is split into fragments, it passes through the urethra and is called 'śarkarā' (gravel)." *Charaka* VI. 26. 21¹²⁷.

"Gravel (śarkarā), sand (śikatā—uric acid brick dust, a fine yellow reddish sediment) and amorphous phosphates (bhasmākhya-meha) are varieties of lithiasis. The symptoms and pain of gravel resemble that of calculus. If the calculi (concretions) are tiny, they are excreted with the urine, with favorable 'vāyu'. If the calculus is split up into minute fragments by 'vāyu', it is called the gravel. The gravel causes heartache, fatigue of the thighs, pain in the perineum, tremor, polydipsia, nausea, cyanosis, anemia, weakness, anorexia and indigestion, if the gravel be obstructed in the passage through the urethra.

127.

यदा तदाश्मर्युपजायते तु क्रमेण पित्तेष्विव रोजना गोः ॥
 कदम्बपुष्पाकृतिरश्मस्तुल्या जलक्ष्णा त्रिपुण्ड्रप्यथापि वदो ।
 मूत्रस्य चेन्मार्गस्तुपैति रुद्धा मूत्रं रुजां तस्य करोति वल्ली ॥
 वज्राति नेद्रं स तु वेदनात्तां न दुः शक्नोति वेपते च ।
 सलीबनोनेह न वस्तिगुल्मं विशेषधाराश्च करोति मूत्रम् ॥
 चोभात् च ते मूत्रयतोह साक्षं तस्याः सुखं मूत्रयति व्यपायात् ।
 एषा श्मरो मासतभिन्नमूर्तिः स्याच्छर्करा मूत्रपथात् चरणी ॥

चरकसंहिता, चिकित्सास्थानम् २६ ।

"The bladder is situated in the midst of umbilicus, back-bone, pubic bones, scrotum, rectum, groin and the urethra. The bladder has only one orifice or outlet (urethra) and its base is downward, its skin (muscular coating) is thin. The bladder is like bottle-gourd (*alābu-lagenaria vulgaris ser*) in shape and is covered with nerves, arteries and veins. The bladder is situated in the pelvis, between the pubic bones in front and the rectum (in woman, the uterus) behind. During the fetal and infantile life, it is usually situated above the pubes. It is a flattened, more or less horizontal body, when empty, but when distended, it becomes an oval bag and rises so as to occupy more or less the hypogastrium. It is attached below, but free to expand above. It is essentially a muscular organ, lined with mucous membrane and covered except in its lower portion with a loosely attached peritoneal coat. Into its lower and posterior portion, the ureters empty, and from its neck the urethra arises. When not over-distended, it holds about a pint of urine—somewhat more in woman than in man. It is a hollow organ, serving as a receptacle for the urine and has a strong muscular investment of unstriped muscles in several layers, which are innervated by branches from the sacral nerves).

The bladder, the bladder-neck, (perhaps including the prostates) urethra, testicles and rectum are all united in one system (genito-urinary) and is situated within the pelvis. The other name of the bladder is the '*receptacle for the excretory product*' (*malādhāra*), and it is a vital organ. As rivers discharge their waters into the ocean, so the tubules in the digestive canal (*the kidneys* are bean-shaped organs, about $4\frac{1}{2}$ inches in length and 2 inches in width and $1\frac{1}{2}$ inches in thickness, lying on either side of the spinal column, behind the peritoneum, about opposite the twelfth thoracic and first three lumbar vertebrae. At the inner edge of each kidney is a concave depression, the '*hylus*', where the vessels and the nerves enter and leave the organs and where the ureter emerges. The kidney is enclosed in a fibrous envelope, the '*capsule*', which dips into the sinus at the hylus. The substance of the organ is divided into cortex and medulla. The former is darker colored and more granular in appearance than the latter; it contains the Malphigian corpuscles and most of the convoluted tubules. The medulla is lighter in color and striated and contains the majority of the straight tubules; it is formed of the pyramids whose bases rest in the cortex and

whose apices are the renal papillæ at which point the central collecting tubule opens into a calyx, this in turn emptying into the pelvis of the kidney from which the water with the waste products of metabolism dissolved into it passes into the ureter and thence into the urinary bladder, discharges the urine into the bladder. These tubules are thousands in number and because of their minuteness, they are invisible. Awake or asleep they trickle down by osmosis (*niṣyanda*) and fill up the bladder, as a new earthen pot (porous) is filled up by the surrounding water, if pressed down into it up to its neck." *Suśruta* II. 3. 13-14¹².

"Calculus is hard to cure and is dangerous.

128. शर्करा सिकता मेहो भक्ष्याण्योऽश्मरिवैकतम् ।
 अश्मर्याः शर्करा त्रया तुल्यव्यसनवेदना ॥
 पबनेऽनुगुणे सा तु निरित्यस्या विशेषतः ।
 सा भिन्नसूतिं वांतेन शर्करेत्यभिधीयते ॥
 दृत्पीडा सकृदसदनं कुक्षिशूलं सवेपथु ।
 दक्षोर्ध्वगोऽनिलः कार्श्या दीर्घस्थं पाण्डुगात्रता ॥
 अरोचकाविपाकौ तु शर्करातो भवन्ति च ।
 सूत्रमार्गप्रवृत्ता सा सक्ता कुर्यादुपद्रवान् ॥
 दीर्घस्थं सदनं कार्श्या कुक्षिशूलमरोचकम् ।
 पाण्डुत्वमुच्चवातश्च दृक्षां दृत्पीडनं वनिमः ॥ १३

When it is young (tender), it may be controllable by medicines, but when it is mature (hard), it has to be extracted by operation.

“In the preliminary stage of lithiasis oleaginous potions are beneficial and remove the cause of its formation. A decoction of *Plectranthus scutellaroides*, *Aeschynomene grandiflora*, *Pothus officinalis*, *Oxalis*, *Asparagus racemosus*, *Flacourtia cataphracta*, *Solanum jacquini*, *Flacourtia sapida*, *Columba domestica*, *Solanum melongena*, *Barleria caerulea*, *Pentaptera arjuna*,

नाभिपृष्ठकटीमुष्क-गुदवङ्क्षणशेफसाम् ।

एकहारस्तनुत्वक्को मध्ये वक्षिरधोमुखः ॥

अलाव्या इव रूपेण शिरास्त्रायुपरिगृहः ।

वक्षिर्वक्षिशिरस्यैव पौरुषं वषणी गुदम् ॥

एकसन्वन्धिनी ह्येति गुदास्थिविवरस्थिताः ।

मूत्राशयो मलाधारः प्राणायतनमुत्तमम् ॥

पक्षाशयगतास्तत्र नाब्धौ मूत्रवहास्तु याः ।

तर्पयन्ति सदा मूत्रं सरितः सागरं यथा ॥

सूक्ष्मत्वान्नोपलभ्यन्ते रुक्मान्यासां सहस्रशः ।

नाडीभिरुपनौतस्य मूत्रस्याभाशयान्तरात् ।

जायतः स्वपतस्यैव स निष्पन्देन पूर्यते ॥

आ रुक्मात् सखिली नवतः पार्श्वेभ्यः पूर्यते नवः ।

चटो यथा तथा विद्धि वक्षिन्त्रेण पूर्यते ॥ १४

सुश्रुतसंहिता, निदानस्थानम्, १ ।

Andropon muricatus, *Trapa bisponosa*, *Hedysarum gangeticum*, *Bballuca*, *Capparis trifoliata*, *Tectonae grandis fructus*, *Hordeum hexastichon*, *Dolichos biflorus*, *Zizyphus jujuba* and *Strychni potatorum fructus*, seasoned with clarified butter, and sprinkled with alkaline earth, if drunk in proper doses, causes fracture of the calculi. And in addition, in this treatment alkalies, barley-water, soup, astringents and milk should be drunk for the amelioration of 'vāta'. *Subruta* IV. 7. 3¹²⁰.

129.

अश्वमेदी दाहस्यो व्याधिरन्तकप्रतिभो मतः ।

शौथसिखदणः साध्यः प्रवृत्तश्चेदमर्हति ॥ १

तस्य पूर्वमु रूपेषु खेडादिनाम् इष्यते ॥

तेनास्त्रापचयं यानि व्याधेर्मृत्तान्यशेषतः ॥

पाषाणमेदी वसुको वयिराश्वमेदी तथा ।

शतावरी श्वदंष्ट्रा च उद्धती कण्टकारिका ॥

कपोतवहासर्गलः ककुभोशीरकुसुमकः ।

वृषादनी भङ्गु कच वदणः शाकजं फलम् ॥

यथाः कुसुम्याः कोष्ठाणि कतकस्य फलानि च ।

ज्वरकादिप्रतीवापनेषां कार्यैर्हृतं कृतम् ॥

मिनति वातसन्धूतामश्वमेदीं चिद्रुनिव तु ।

आरान् यवागूयं चास कषायाणि पर्यासि च ।

भोजनानि च कुर्वीत वर्गेऽस्मिन् वातनाशने ॥ २

मुमुक्षुर्नमः कृता, चिकित्सितस्त्वाम्, ७ ।

Spontaneous fracture of stone has been observed by many in the bladder (*Ord, Debout d' Estrees, Fenwick, Martin*, etc), either by radical cleavage from the centre to the periphery or by splitting in concentric laminae. It has been demonstrated that spheres of carbonate of lime, which had formed in solutions of gum, split radially and disintegrate, if placed in a solution of different specific gravity. It is possible that in a similar way, the urinary calculi split and disintegrate under the influence of varying specific gravities and reactions of the urine, which causes molecular tension and cleavage, and consequently spontaneous cure takes place at some famous springs (as Carlsbad or Contrexeville) which enjoy special reputation for this curative property. Uric acid or oxalate of lime calculi can be formed only in strongly acid urine while in the alkaline urine phosphates of ammonia and magnesia are precipitated. Therefore if in the uric acid or oxalate of lime calculus, the urine can be made and kept alkaline for some time, it is likely to create molecular instability of the calculi and split them into fragments, gravel or brick dust. And vice versa in phosphate calculi, Carbonate of potash, acetate of potash, piperine, common and lithia

salts are also reputed to exercise a solvent action upon uric acid crystals in the urine.

"If emulsion, alkalies (carbonate of potash), astringent infusion, milk and bougie do not relieve the calculi, then operation is the only remedy. *Suśruta* IV. 7. 11¹³⁰.

"Place the patient upon the lap of a strong man (to hold in position) seated on a knee-high table. The patient with courage and determination stretches his upper part on his back and his pelvis raised by a cushion underneath it; the legs are to be flexed (to about a right angle with the table) and supported by a man (on each side), or held in position by a cloth crutch. Then the umbilical region should be massaged and pressed with unguents by hands as long as the calculus does not come below the umbilicus. Next after manicuring and lubricating the fingers with oil, the fore and the middle-fingers of the left hand should be introduced in the rectum towards the raphe scroti. When the calculus has been found, it should be carefully forced down between the

130. छतैः चारेः कषायैश्च क्षौरेः सोत्तरवस्तिभिः ।

यदि गोपयन् गच्छेद्देस्तत्रोत्तरो विधिः ॥

सुश्रुतसंहिता, चिकित्सितस्थानम्, ७ ।

middle of pubis and the urethra, and placed in an even, medium-sized and polished staff, and pressed so hard that the calculus appears like a tumor....Incision should be made about third of an inch to the left of the raphe scroti (and an inch and half from the anus) of the size of the calculus. According to some (authorities), if it facilitates the operation, incision can also be made at the right side. But care should be taken that the calculus be not broken (into fragments) by the instruments or pulverized, for if even a minute fragment remains (in the bladder), the calculus grows (round it as nucleus). Therefore for extracting calculi, use forceps with curved blades (serrated and concave in the inner side).

“In woman, the uterus is situated by the bladder, therefore do not make long incision, nor deep incision, as it might wound the sphincters (*mūtra-srāvī*). If the incision is made at the proper place (by distending the bladder upward and forcing the calculus downward), it might also result in the incontinence of urine in man by severing the sphincters (by the lateral perineal incision). Without lithotomy, there cannot be any break in the bladder, but if it does (in rupture by over-disten-

sion), the patient dies. If however in the extraction of the calculus, the bladder is penetrated, the patient might survive, for the medicines that are used for the healing of the incision wound, can be also applied for the cicatrization of the other wound. And the penetration of the bladder (sphincters ?) is not in violation of the (medical) code. Moreover, the urine causes the formation of the calculus, and the little incontinence of the urine can not do much harm, and though the barley-water is diuretic, it is found beneficial (in lithiasis). After the extraction of the calculus, the patient should be given hot sitz bath (hip bath), for in hot water, the bladder can not be filled with blood. But if it takes place, the bladder shall be irrigated with astringent effusion of *Ficus glomaratae*." *Suśruta* IV. 7. 13-15¹³¹.

"Prostatolith or phosphatic crystals (prosta-

131. ततो बलवन्मनसि बलवान्मानुषोऽपि फलकं प्रागुपवेश्य पुनश्च तस्योत्-
मङ्गे निवर्णपूर्वकायमुत्तानमुन्नतकटीकं वस्त्रधारकोपविष्टं सङ्कुचितजालुक्ष्मं रजितरिच-
सङ्काववद्धं सूत्रेण शट्कैर्वा ततः स्वभ्यक्तनाभिप्रदेशस्य वामपार्श्वं निश्चयं मुष्टिनाव-
पौक्येदधोनाभिर्यावदश्मर्य्यधः प्रपञ्चेति । ततः खेडाभ्यन्ते कृत्वा तन्त्रे वामहस्ताप्रदेशिनी-
मध्यमे पायीं प्रणिभायातु सेवनीमासाद्य प्रयत्नबलाभ्यां पायुर्निद्राकारमानीय निर्व्याघात-
मनायतनमिवमच्च वक्षिं सन्निवेश्य भृशमन्तपौक्येदङ्कुलिभ्यां यथा यन्त्रिपरिवोन्नतं ब्रह्मं
भवति ।

tic calculi are of two kinds—those formed in the kidney or bladder and lodging in the prostatic sinus, and those which originate in the gland itself), if they are dislodged from their own cavities and are locked up in the passage through the urethra, they should be extracted (by forceps) through the urethral passage. If it can not be done then an incision should be made in the urethra (*median perineal urethrotomy*) and the calculus extracted by hook-forcep. And though the wound is cicatrized for a year, sexual intercourse, riding horses and elephants, tree-

स चेद् गृहीतयस्ये तु विहतासौ विचेतनः ।

हृतवज्रवशीर्षं निर्विकारी मृतीपमः ॥

न तस्य निर्हरेच्छस्यं निर्हरेत् तु विद्येत सः ।

विना र्वतेषु रूपेषु निर्हरेत् समुपाचरेत् ।

सस्ये पात्रे सेवनीं यवमात्रेण मुक्तावधारयेत् शस्त्रमश्वरोप्रमाणं; दक्षिणतो वा क्रियासौकर्यहेतोरित्येके । यथा च न भिद्यते चूर्णते वा तथा प्रयतेत, चूर्णमस्यमध्यस्थितं हि पुनः परिहृतिमिति, तथात् समसामयवक्तो वादहीत ॥ १२

स्त्रीषाम्नु वसिषाश्रगतो गर्भाशयः सन्निकृष्टः, तथास्त्रासामुत्सङ्गवच्छस्यं पातयेत् पततोऽन्यथा खल्लावां सूत्रकापी वशी भवेत् । पुत्रवस्य वा सूत्रमसौक्यवशनाम्नूत्तरवम् । अश्वरीवशाहते भिन्नो वसिरेकधा न भवति, विधाभिन्नवसिराश्वरिणी न सिध्यति ॥

अश्वरीवशनिमित्तमेकधाभिन्नवसिर्नोवति क्रियाभ्यासात् शास्त्रविहितश्चेदाग्निः सन्दपरिहृतत्वाच्च शक्यस्येति । सङ्कृतयस्यन चोदकद्रोखामवतार्य स्वेदयेत्, तथा हि वसिरसृजा न पूर्यते । पूर्ये वा शीरहृच्चकायं पुष्पनेत्रे च विदध्यात् ॥

सुनुतसंहिता, चिकित्सितसंग्रहम्, ७ ।

climbing, mountaineering, charioteering and swimming should not be indulged in ; heavy indigestible food should also be avoided.

Make incision so that the prostate, vesicula seminalis, vas deferens, ureter, raphe scroti, vagina, rectum or the bladder are not hurt. If the prostates are severed, death takes place by the accumulation of urine in the bladder (the passage for the discharge of the urine into the urethra being blocked by the tumorous or hypertrophic growth of the prostate); by the severance of the vesicula seminalis, death or eunuchism takes place ; by the severance of vas deferens, impotence ; by the severance of the ureter, dispersion of the urine (to the contiguous tissues by percolation) ; wound in the raphe scroti causes intense pain ; and if the bladder and the rectum are wounded, all the symptoms due to their penetration, mentioned before, appear. *Suśruta* IV. 7. 19-20¹³².

Modern lithotomi hardly differs much from that of the *Suśruta* school, especially when lateral

132. मूत्रवहशक्रवहसुष्णोतोमूत्रप्रसेकसेवनौयोनिगुदवसौन् परिहरित् । तत्र मूत्रवहश्चेदान्तरणं मूत्रपूर्यं वसोः शक्रवहश्चेदान्तरणं क्लेश्यं वा । सुष्णोततपचाता-
वज्रजम् । न मूत्रप्रसेकचयनान्म त्प्रचरयन् । सेवनौयोनिश्चेदाद्गुणः प्रादुर्भावः ।
वसिगुदविह्वलचयं प्रायुक्तमिति ॥

incision is made, except that before operation, the bladder is drained off and distended by hot boracic lotion, and kept in that condition during operation by plugging the spigot of the silver catheter by which the injection has been introduced. But generally now-a-days supra-pubic operation is preferred, but below the peritoneum, as higher up serous membrane is met. After the bleeding has stopped, the wound is closed by sutures.

However, litholapaxy seems to be the favorite means adopted for the removal of vesical calculus. And when the urethra is not roomy enough to admit an instrument of adequate calibre, or the stone is very large or hard (oxalate of lime calculus), and if under these circumstances, litholapaxy can not be practised, lithotomy is adopted for the removal of the stone. Lithotritry consists of crushing the stone within the notched and fenestrated inside surface of very hard steel

भवतयाव

मन्त्राव्यष्टावसन्नुध्य खोतोजानि शरीरिणाम् ।

व्यापादयेद्ब्रह्मन् मन्त्रान् शस्त्रकर्मा पटुर्भिक्षम् ॥

सेवनी यक्रहरणी खोतसौ फलयीर्गुदम् ।

सूत्रसर्कं सुतवह्मं सत्तवस्तिस्तथाष्टमः ॥

सुयतसंहिता, चिकित्सितस्थानम्, ८ ।

blades under a severe and continuous pressure into a very fine powder, and the removal of the detritus by flushing out through a full-sized hollow metal catheter and an India-rubber wash bottle.

V Diseases of the mouth.

"There are sixty-five diseases of the mouth. The centers of their origin are seven, namely, lips, gum, tooth, tongue, palate, throat and the buccal cavity. Of these the lips have eight kinds of diseases, gum fifteen, teeth eight, tongue five, palate nine, throat seventeen, and the buccal cavity three". *Suśruta* II. 16. 2-3¹³³.

"In the 'vāta' affections, the lips are asperous (herpes upon the lips are common in malaria, fevers, pneumonia, acute coryza as well as other febrile diseases; cracks or fissures—*rhagades*—or the scars resulting from them, if occurring in infants or children, are indicative

133. म खरोगाः पञ्चषष्टिः समस्त्रायतनेषु । तद्वायतनान्यथै दन्तम लानि दन्ता ।

जिह्वा तालु कण्ठः सर्व्वाणि चेति ॥

तद्वायतनोष्ठयोः पञ्चदश दन्तम लेषु । अष्टौ दन्तेषु । पञ्च जिह्वायाम् । नव
तालुनि । समदश कण्ठे । तयः सर्व्वायतनेषु ॥

सुश्रुतसंहिता, निदानस्थानम्, १६ ।

of congenital syphilis ; the vertical crack in the middle of the lower lip, as occasionally seen, may be due to defective nutrition or may be associated with stomatitis), dry (associated with herpes or gastro-intestinal disorders, numb (labial paralysis or bulbar palsy), blackish (cyanosis associated with open and dry lips is indicative of dyspnea, due to disease of the heart or lungs, especially the chronic forms as emphysema or failing compensation in valvular lesions ; otherwise it may be associated with the associated local diseases of the mouth as stomatitis, glossitis, cancer of the mouth, phlegmonous tonsillitis, or some form of nasal stenosis), pressed and heated (loose and pendulous lips are suggestive of diphtheritic paralysis, chronic bulbar palsy ; and associated with open lips it is observed in various conditions of prostration, in idiocy and in cases of insanity).

“In the ‘*pitta*’ affections of the lips, the lips are bluish (*cyanosed*), bronzed (in Addison’s disease), and are covered with many vesicles like mustard seeds which give burning sensation, rupture and exudate (in aphthous or follicular stomatitis, small vesicles appear on the inner surface of the lips, or cheeks or edges of the tongue and soon rupture, leaving small and

very sensitive superficial grayish ulcers with red areolae).

“In the ‘*kapha*’ affections of the lips, the lips are covered with mucous patches like the color of the skin, and they are painless, pruritic, edematous, slippery, tepid and heavy (flattened, warty outgrowths, strictly delimited, coated with a gray matter, and found at the angles of the mouth, are the mucous patches of the secondary stage of syphilis ; congenital hypertrophy—*macrocheilia*—is caused by distension of the lymphatic space).

“In the vitiation of the three humors, the lips are sometimes blackish (cyanosed), sometimes bronzed (in Addison’s disease), or pallid (in anemia), and are covered with various kinds of eczemas.

“In the labial diseases, originating from the derangement of the blood (vessels), the lips are covered with tumors which have color like dates (reddish brown), and they contain blood and bleeding takes place from them (*angioma*).

“In the labial diseases, from the corruption of flesh, the lips become heavy and swollen, and the tumors appear like meat balls and germs from the edges enlarge the ulceration (a somewhat irregular ulcer, usually upon the lower lip,

gradually enlarging, recurrently scabbing over and becoming denuded, is probably an epithelioma).

“In the adipose labial affection, the lips are pruritic, numb, soft and heavy, and they are bright like the outer layer of clarified butter ; and from them there is a clear exudation like clear crystal (congenital hypertrophy, *macrocheilia*, is caused by distension and dilatation of the lymphatic spaces, the lower lip being frequently affected).

“In the traumatic lesions of the lips, there is a terebrant pain, or like that of a wound from an axe, and it becomes like the color of blood (inflamed), tumorous (inflammatory swelling) and pruritic.” *Suśruta* II. 16. 5-12¹³⁴.

134.

कर्कोशी पदवी सखी कृष्णी तीव्रवर्ण्विती ।

दाख्ये ते परिपाख्ये ते शोष्णी मासतकोपतः ॥ १

आचिती पिङ्गकाभिस्तु सधपाकतिभिर्मृगम् ।

सदाहपाकसंखावी नीली पीती च पित्ततः ॥ २

सवर्णाभिस्तु शीघ्रैर्ते पिङ्गकाभिरवेदनी ।

कश्चमनी कफाच्छुनी पिच्छिणी शोतली गुरु ॥ ३

सक्तकृष्णी सक्तपीती सक्तच्छुती तथैव च ।

सन्निपातेन विज्ञेयावनेकपिङ्गकाचिती ॥ ४

खञ्जूरफलवर्णाभिः पिङ्गकाभिः समाचिती ।

रक्तोपलुष्टी हृषिर्हवतः शोचितामनी ॥ ५

Diseases of the Gum.

In '*śitāda*' the gums are bleeding, ulcerative with foul-smelling exudation, and soft (spongy); this disease is due to the vitiation of the blood and the '*kapha*' (*gangrenous stomatitis*).

In '*danta-puppuṭaka*' there is an intense pain and swelling at the root of one or two teeth for a time; this is due to the vitiation of the '*kapha*' and the blood. (*Gum boils* are usually formed round a foreign particle, especially with the tartar deposit encrusted with the pyogenic bacteria, but their outlet of discharge being closed).

The disease in which the teeth become loose, and from the tooth-sockets blood and pus come out, is called '*danta-veṣṭaka*' (in *pyorrhea alveolaris*, the teeth become loosened as the gum

मांसदण्डी गुरु स्थूली मांसपिच्छवद्गती ।

जलवन्नाव मूर्च्छन्ति शुक्लसोभयती मुखान् ॥ १०

मिदसा घृतमन्त्राभौ कण्डू मन्त्रौ स्थिरौ मद्र ।

अण्डस्कटिकसं काशमाकाशं चयती गुरु ॥ ११

अतत्राभौ विदीर्येते पाच्येते चामिघाततः ।

यथितौ च समाख्यातायोष्ठी कण्डू समन्वितौ ॥ १२

चरकसंहिता, निदानस्थानम् १६ ।

recedes or the pus socket causes necrosis of the tissues at the root. The affection is probably due to streptococcal infection of the periosteum of the alveoli. Usually it is associated with an excess of tartar deposit or the carious condition of the teeth).

The disease in which the gum has a pruritic and painful inflammation, and salivation, is called the '*śauśira*' (*gingivitis*).

The disease in which the teeth are loose in their sockets, the palate is falling (*uvula descendens*) and ulceration in the gum and pain in the buccal cavity, is called the '*mahā-śauśira*' (*gangrenous gingivitis*).

The disease in which there is ulceration and bleeding of the gum, is called the '*paridara*' (*phlegmonous gingivitis*).

The disease in which there is necrosis of the tissues in the sockets, and for this reason the teeth become loose, there is bleeding at the slight pressure of the teeth, but slight pain, and with the bleeding the mouth becomes foul-smelling, is called the '*upakuśa*' (*chronic hyperrophic gingivitis*).

If strong inflammation follows the traumatism of the gum, and the teeth become loose, it is called '*vaidarbha*' traumatic interstitial *ulitis*).

If an extra tooth appears due to the influence of 'vāyu' with intense pain, it is called the '*varddhana*' (*wisdom tooth* or dens serotinus, the most posterior of the molar teeth appear about the eighteenth year). The pain ceases after the tooth comes out.

"The disease in which in the gum of the lower posterior tooth, there is a large neoplasm with intense pain and salivation, is called the '*adhimāmsa*' (epithelioma or *epulis*. Epulis is a fibrous growth and develops in the peridental membrane; it is often found near a decayed tooth, grows slowly and forms a more or less pedunculated tumor of the same color as the gum).

The tumors of the gum are of five kinds with symptoms similar to those that have been described of the tubular vessels, by the corruption of 'vāyu, pitta, kapha, their morbid combination or infection' and they are known as '*pañcha-nāḍī*' (*alveolar abscesses* are nearly always due to sepsis originating in a decayed tooth. (1) The pus may be limited to the margin of the gum, forming a tumor. (2) The pus may be slow in forming and there may be a great inflammatory infiltration of the cheek with the edema of the face and spasm of the masseter

and pterygoid muscles. (3) The pus may extend widely beneath the periosteum and cause necrosis of the jaw. (4) A persistent sinus or sinuses may be present if the abscess has burst spontaneously or has been opened externally; there is either a dead tooth, a portion of a fang or a piece of necrosed bone which keeps open the sinus. (5) The pus may burst into the antrum of the upper jaw or extend deeply and widely in the neck)". *Sūtrata* II. 16. 14-24¹³.

135.

शोणितं दन्तवेष्टेभ्यो यस्याकृत्वात् प्रवर्तते ।
 दुर्गन्धेनि सक्तानि प्रकृद्दीनि मृद्नि च ।
 दन्तमांसानि शीर्यन्ते पचन्ति च परस्परम् ।
 शीतादो नाम स व्याधिः कफशोणितसम्भवः ॥ १४
 दन्तयोस्त्रिषु वा यस्य त्रयषुः सबजो महान् ।
 दन्तपुपुटको ज्ञेयः कफरक्तानिमिश्रणः ॥ १५
 खलनि पूयदधिरं खला दन्ता भवन्ति च ।
 दन्तवेष्टः स विज्ञेयो दुष्टशोणितसम्भवः ॥ १६
 त्रयष्टुर्दन्तमूलेषु रज्ज्वावात् कफरक्ततः ।
 क्षालात्वापी स विज्ञेयः कण्डूमान् शीपिरो गदः ॥ १७
 दन्ताखलानि वेष्टेभ्यस्तु चाप्यवदीर्यन्ते
 दन्तमांसानि पचन्ते सुखं च परिपीड्यते ।
 यच्चिन् स सर्वज्ञो व्याधिर्नङ्गाशीविरसंशयः ॥ १८

Diseases of the Teeth.

“The disease in which the tooth becomes blackened and perforated by microbes, due to the vitiation of the blood, and the tooth becomes loose accompanied by inflammation of the gum, pain and salivation; is called the ‘*krimi-dantaka*’ *dental caries* : it is a fact of common observation that caries begin only at spots protected from friction or left uncleansed as (a) pits, grooves and fissures in the enamel; (b) proximal surfaces just above the contact points; (c) surfaces which for any cause are habitually

दन्तानासनि शीर्ष्यन्ते यस्मिन् दान्ति चाप्यसृक् ।

पित्तासृक्कफजो व्याधिश्च यः परिदरा हि सः ॥ १८

वेष्टेषु दाहः पाकश्च तैव्यो दन्तासलनि च ।

आचक्षिताः प्रसवन्ति श्लेष्मिन् मन्दवेदनाः ॥

आज्यायको क्षुति रक्ते मुखं पूति च जायते ।

यस्मिन् पकुञ्चः स स्नात् पित्तरक्तजतो गदः ॥ १०

सृष्टेषु दन्तमुखेषु स रन्ध्रो जायते महान् ।

भवति च चक्षा दग्ताः स वैदर्भोऽभिधातजः ॥ ११

जायतेनाधिको दग्तो जायते तीव्रवेदनः ।

वर्धनः स जतो व्याधिर्जाति रक् च प्रक्षायति ॥ १२

क्षान्त्ये पश्चिमे दग्ते महाप्लीषो महादन्तः ।

काक्षाकायो कफजतो विज्ञेयः सोऽधिमांसकः ॥ १३

दन्तमुखानता नाथः पक्ष श्रेया मथेरिताः ॥ १४

सुमुतर्क्षिता, निदानसंग्रहम्, १६ ।

unclean ; (d) necks of the teeth at or near the junction of the cementum and the enamel. In these localities, the oral bacteria, protected from friction, attach themselves to the enamel, forming microbic plaques which are sufficiently adherent to attach themselves, obtaining their food supply from the carbohydrate and the albuminous particles that adhere to those spots and are not thoroughly cleansed. From carbohydrate fermentation, lactic acid is produced and this is prevented from being diluted and washed away ; the slightly alkaline salivary secretion by the bacterial plaques and added to it, the enzymes secreted by the bacteria, attack the inorganic matter of the enamel following first the interprismatic cement substance between the prisms, later dissolving the transverse cement substance of the globules. The effect is to 'produce an irregular and roughened surface, and in the process of enamel dissolution and decalcification, the bacteria enter into the crevices and gradually gain access to the dentine. The *leptothrix buccalis maxima* is invariably associated with more or less streptococci and *bacillus buccalis maximus* in rapid dental caries).

The disease in which the teeth are very

sensitive to cold or heat (paroxysms of pain induced by thermal stimuli), is called the '*danta-harṣa*' (*hyperemia of the dental pulp*: the most common cause of active hyperemia of the pulp is a lessening of the non-conducting covering of the organ—enamel and dentine, through abrasion, erosion, fracture or caries, leading to an increased response and continued irritation of the pulp through the thermal stimuli).

The disease in which the face becomes misshaped (either by caving in through necrosis of the jaw-bone or with odontomes which are neoplasms composed of dental tissues in varying proportions and different stages of development), the teeth become eroded and painful, is called the *bhañjanaka* (*necrosis of the jaw with odontomes and erosion of the teeth*).

If the solids (*mala*=the mineral constituents and the mucus of the saliva) are dried up and become sugar-like hard on the teeth, by '*vāyu* and *pitta*' it is called the '*śarkarā*' (*salivary calculus* or *tartar*: the deposition of the tartar is perhaps activated by the bacterial fermentation, causing the precipitation of the mineral salts, chiefly calcium phosphate enclosing with them the epithelium and the bacteria, especially the leptothrix forms).

If this tartar scales out with the dentine, it is called the *kapālikā* (large tartar formations) ; it is very destructive to teeth.

If by the vitiated blood and the '*pitta*', the enamel of the teeth become burnt (stained) dark-brownish or greenish, it is called the '*tyāva-dantaka*' (the green stain of the enamel : these most common green deposits upon enamel occur upon both the temporary and the permanent teeth, particularly of young persons ; the deposits usually have a concentric form and are mainly upon the labial faces of the anterior teeth. The green stain is usually preceded by a lack of oral hygiene and superficial decalcification of the enamel, as it is found slightly roughened, indicating the action of the acids upon it by fermenting food particles sticking to it. The green stain is the more advanced stage of the dark-brownish coloring).

If the jaw is fractured by the source of '*vāyu*' through loud talking, chewing of hard substances or yawning, it is called '*hanu-mokṣa*' (fracture of the jaw) ; it gives all the symptoms of tetanus (the fracture of a healthy jaw is only possible through traumatism. But if it is eaten up by necrotic process as in the tertiary

stage of syphilis, tubercular caries, phosphorus poisoning or local sepsis, and made very brittle, it may be easily fractured by any slight sudden tension as chewing any hard substance or movement). *Suśruta* II. 16. 27-33¹³.

Treatment: "Without injuring the gum, all the tartar deposits have to be carefully scaled out (by scalers) ; then those parts of the teeth are to be polished with the powder of *Butea frondosa* (*lākṣā*) mixed with honey. (The modern treatment for the tartar is just the same, except that to secure the smoothness of the

136. कृच्छ्रश्चिद्र चक्षुः क्षावी समरग्भो महाबलः ।
 अग्निमित्तवजो वातादिश्लेष्मः क्रिमिदन्तकः ॥ १७
 दशनाः शतमन्त्रस्य सङ्गमे स्वयमेव न च ।
 यस्य तं दन्तद्वर्षं नु व्याधिं विद्यात् सर्वरक्षात् ॥ १८
 वक्त्रं वक्त्रं मवेद्यन्ति दन्तमङ्गस्य तं वक्त्रम् ।
 कफवातकृत्तो व्याधिः स भक्षणकसंघितः ॥ १९
 शकं च स्थिरीभूतो मखी दन्तेषु यस्य वै ।
 सा दन्तानां गुणज्ञो तु विद्मो या दन्तशर्करा ॥ २०
 दन्तैः दन्तवल्ग्वानि यदा शर्करया सङ्ग ।
 श्लेष्मा कफादिका सैव दशानां विनाशिनौ ॥ २१
 योऽष्टकमिच्छेत् पित्तेन दग्धो दन्तश्च शेषतः ।
 श्लाघतां नीलतां वापि नतः स श्लाघदन्तकः ॥ २२
 वातेन तैर्लोमांश्च हनुमन्निर्विसंघतः ।
 हनुमोच इति श्लेष्मो व्याधिरर्द्धितलक्षयः ॥ २३

सुश्रुतसंहिता, निदानस्थानम्, १६ ।

scaled surface, so that no nucleus is left for the new tartar deposit, pumice-powder on a piece of wood is used, instead of the powder of *Butea frondosa* with honey)." *Susruta* IV. 22-23¹³⁷.

"The alveolar abscesses should be treated in the same way, as an ordinary abscess, with this difference, that the tooth with the sepsis of which the abscess has been formed, must be extracted. If it can not be done, then after cleansing (an incision is made, large enough to open the abscess cavity fully, inside the mouth, all the pus is thoroughly drained off, and the abscess cavity is repeatedly washed with antiseptic and astringent infusion or decoction), the abscess cavity should be cauterized either by caustic or cautery. If the alveolar abscess is neglected, it is sure to cause necrosis of the jaw. Therefore the tooth should be uprooted (thus cure may be effected in light cases, by causing the abscess drainage through the tooth socket). If the bone has

137.

अङ्गिरसं दन्तमूलानि शर्करासुखरेदभिरम् ।

साध्यान्मूर्ध्नि धुनुतेऽतस्तथाः प्रतिसारयेत् ।

सुश्रुत-निरुद्धिता, चिकित्सितस्थानम्, २९ ।

been affected (necrosized), it should be also scraped off." *Suśruta* IV. 22. 18¹³¹.

"The disease in which the teeth seem to be rent asunder with pain, is called 'dālana' (odontalgia of neuralgic character or due to caries or periodontitis)." *Suśruta* II. 16. 26¹³².

The Diseases of the Tongue.

"The disease in which the tongue becomes inflamed, due to the derangement of 'vāyu', loses its sensibility to taste, and becomes fissured like that of the leaves of 'tectona', is the 'vāta' disease of the tongue (glossitis desiccans or chronic superficial glossitis may be induced by

138. सामान्यं कर्णं नाडीनां विशेषश्चात मे शृणु ।
यं दन्तमभि जायेत नाडी तं दन्तसुखरेत् ॥
क्षिप्त्वा नासाणि शस्त्रेण यदि नोपरिजो भवेत् ।
शोधयित्वा दक्षिणापि चारिण ज्वरनेन वा ॥
भिन्नभाषेक्षिते दन्ते हनुकास्थिगतिर्भवम् ।
समूहं दशनं तस्मादुद्धरेद्भग्नमस्थि च ॥ १८
सुश्रुतसंहिता, चिकित्सितस्थानम्, ९९ ।
139. दाह्यन्ते बहुधा दन्ता यस्मिंस्तैर्ब्रह्मगन्विताः ।
दाह्यन्तः स इति श्रेयः सदागतिनिमित्ततः ॥ २६
सुश्रुतसंहिता, निदानस्थानम्, १६ ।

persistent and excessive use of tobacco, spirits and highly spiced foods ; it is characterized by the slow formation of a number of deep fissures and indentations, in the depth of which there are ulcers and excoriations).

“The tongue is dark-yellowish, congested and is covered with blood-red fissures in the ‘*pitta*’ disease of the tongue (the raspberry tongue has a pale-red surface, from which project greatly swollen and bright-red fungiform papillæ, as it appears in the first stage of the scarlet fever or in other acute specific infections).

“The tongue is swollen, heavy and is covered with a fur, resembling the thorns of ‘*Bombaxis heptaphylli*’ in the ‘*kapha*’ derangement of the tongue (the tongue is flabby, swollen, indented and covered with a uniform, yellow pasty fur in catarrhal gastritis or gastro-duodenitis).

“The severe inflammation that is caused in the tongue by the corrupt ‘*kapha*’ and the blood, is called the ‘*alāsa*’ (glossitis) ; in severe cases paralysis of the tongue and ulceration at its root, (*cellulitis* or parenchymatous inflammation of the tongue is due to the infection of streptococcus ; while acute glossitis may be the result of a burn or wasp-sting).

The disease in which the tongue is inflamed and on the tip of the tongue, there is a salivating, pruritic and painfully congestive tumor, is called '*upajihvikā*' (secondary syphilitic sore, usually as condylomata, accompanied by sub-acute glossitis, arising from the primary hard or tender ulcerating nodule that is seen on the tip of the tongue in a syphilitic lesion; or it may be carcinoma of the tongue.)" *Sutrata* II. 16. 37¹⁴⁰.

The Diseases of the Palate.

"The elongated tumor that develops and spreads from the bottom of the palate like a leathern bag filled with air, is called *galabundikā* (angioma of the palate); it causes polydipsia, bronchitis and dyspnea (in uvulitis).

"The tumor that develops at the bottom of

140. जिह्वानिलेन कर्कशिता प्रसृता भवेच्च शाकच्छदनप्रकाशा ।

पित्तेन पीता परिदग्ने च चिता सरकैरपि कण्टकैश्च ।

कफेन गुठ्ठी बहुला चिता च मांसोद्गमैः शालमलिकण्टकाभैः ॥ ३५

जिह्वातले यः श्वथुः प्रगाढः सोऽस्त्राससंज्ञः कफरक्तमूर्तिः ।

जिह्वा स तु स्तम्भगति प्रवृद्धो मूले तु जिह्वा मृशमेति पाकम् ॥ ३६

जिह्वाप्ररुः श्वथुर्हि जिह्वामुन्नम्य जातः कफरक्तयोनिः ।

प्रसेककण्टपरिदाहयुक्ता प्रकप्यतेऽसावुपजिह्विकेति ॥ ३७

सुश्रु. ३१ हिता, निदानस्थानम्, १६ ।

the palate (an acute abscess from a carious tooth in the upper jaw may spread inwards and raise the muco peristeum of the hard palate) like the (fruit of) '*Memordica monadelphæ*'; it causes pricking pain and *hyperæmia* and it suppurates (*septic tumor of the palate*).

"The reddish and the benumbing tumor that develops in the palate, is called the '*adhruṣa*' (the *peritonsillar abscess* is liable to burrow in the soft palate); it causes high fever and intense pain.

"The slightly painful and pale tumor that develops slowly for a long time like the tortoise shell, due to the corruption of '*phlegma*' is called the '*māṃsa-kachchhapa*' (*endotheliomatous tumor of the palate*).

"The tumor that appears in the palate like the lotus bud, is called the '*arvouda*' (*angioma*); it has all the characteristics of the angioma as mentioned before.

"At the base of the uvula, the malignant and painless carcinoma that grows, is called the '*māṃsa-saṅghāta*' (*papilloma of the uvula*).

"The painless and the chronic tumor that grows in the palate like a plum, due to the corruption of the '*phlegma and fat*', is called the '*tālu pupputa*' (*cyst or gumma of the palate*).

There is much edema and lacerating pain in the palate, and dyspnea, due to the derangement of *pitta* associated with *vāyu* which causes *tālu-śoṣa* when the syphilitic gummata break, septic infection follows, and thus there is usually much edema of the surrounding tissues.

There is malignant ulceration of the palate due to the derangement of '*pitta*', which causes '*tālu-pāka*' (syphilitic ulceration of the palate which may lead to its perforation, usually circular or oval in shape, and finally to its necrosis and destruction of its major part)". *Suśruta* II. 16. 39-47¹⁴¹.

141.

श्लेष्मासृग्गन्धां तालुमूलात् प्रवृद्धो
 दीर्घः शोफोऽध्मातवस्तिप्रकाशः ।
 तृष्णाकासश्वासकृत् संप्रदिष्टो
 व्याधिर्वैद्यैः कण्ठशुण्डीति नाम्ना ॥ ३९
 शोफः स्थूलस्तोददाहप्रपाकी
 प्रागुक्तान्यां तु गिहिकेरी मता तु ॥ ४०
 शोफः स्तब्धो लोहितस्तालुदेशे
 रक्ताक्षयः सोऽधुबो स्रग्ज्वराद्यः ॥ ४१
 कूर्मोत्सन्नोऽवेदनोऽपीक्षणमा-
 जरको ज्ञेयः कण्ठ्यः श्लेष्मया स्यात् ॥ ४२
 पद्माकारं तालुमध्ये तु शोफं
 विद्याद्रक्तादधुबं प्रोक्तलिङ्गम् ॥ ४३

The Diseases of the Throat.

'The gummata that are produced in the pharynx, causing its stricture, due to the vitiated action, either individual or collective, of *'vāyu, pitta, kapha and the blood,'* are called the *'rohiṇī'* (*syphilitic gummata*); due to the pharyngeal stenosis, life is lost (unless it is treated by the regular passage of bougies for the rest of the patient's life, and in some intractable cases gastrostomy may be necessary).

The painful gummata, causing stricture of the pharynx, also appear at the dorsum of the tongue in the *'vāta'* gummatous affection of the pharynx; and it has all the complications of the *'vāta'*.

The *gummata* appear and ulcerate rapidly

दुष्टं मांसं श्लेष्मया नीलज्वल

तालवन्तःस्थं मांससङ्घातमाहुः ॥ ४४

नीलस्थायी कोलमात्रः कफात् स्या-

न्मेदोयुक्तात् पुष्पुटस्तालुदेशे ॥ ४५

शोषोऽत्यर्थं दीव्यते वापि तालु

श्चासौ वातात् तालुशोषः स पित्तात् ॥

पित्तं कुप्यात् पाकमत्यर्थघोरं

तालुन्मेन तालुपाकं वदन्ति ॥ ४७

सुश्रुतसंहिता, निदानस्थान, सू ११

with high fever in the '*pitta*' affection of the disease.

The gummata (or syphilitic nodes) are hard and ulcerate freely in the '*kapha*' affection of the disease, and they cause stricture of the pharynx.

The gummata ulcerate deeply and are very intractable and have all the triple complication in the '*sānuipāta*' (acute) affection of the disease.

The gummata have all the symptoms of the '*pitta*' affection of the disease, and are covered with the abscesses in the blood lesion of the '*rohini*'; it is incurable.

A plum-stone like (*zizyphus jujubæ*), rough and hard tumor that develops and causes tercibrant pain, is called '*kaṇṭha-sālūka*' (*carcinoma of the pharynx*); it is curable by operation. *Suśruta* II. 16. 49-55¹⁴².

142.

गलेऽनिलः पित्तकफौ च मूर्च्छितौ
 शूयक समस्ताश्च तथैव शोणितम् ।
 प्रदूष्य मांसं गलरोधिनोऽङ्कुरान्
 वृजन्ति यान् सासहरा तु रोहिणी ॥ ४९
 जिह्वां समन्ताद्भृशवेदना ये
 मांसाङ्कुराः कण्ठनिरोधिनः स्युः ।
 तां रोहिणीं वातवृत्तां वदन्ति
 वातात्मकोपद्रवगाइवुक्ताम् ॥ ५०

If a tumor (syphilitic or tuberculous cancer) appears at the root of the tongue due to the vitiation of the '*kapha and the blood*' as it appears on its tip, it is called '*adhi-jihvā*' (cancer of the tongue) ; and if it suppurates, it is incurable.

The tumescence that develops like a bracelet and causes the stricture of the esophagus, is called the '*valaya*' (*hypertrophic* thickening in the phreno-cardiac portion of the *gullet*) ; it is intractable and incurable.

The inflammation that causes dyspnea, pain and devitalising, due to the derangement of '*kapha and vāyu*' is the '*valāsa*' (*stenosis of the trachea*, caused by acute edematous inflammation from diphtheria and specific fevers, sometimes leading to perichondritis and erysi-

क्षिप्रोग्नमा क्षिप्रविदाहपाका

तीव्रज्वरा पित्तनिमित्ततः स्यात् ॥ ५१

क्षोतो निरोधिन्यपि मन्दपाका

गुर्वी स्थिरा सा कफसम्भवा वै ॥ ५२

गम्भीरपाकाप्रतिवारवीर्या त्रिदोषलिङ्गा त्रयसम्भवा स्यात् ॥ ५३

रूफोटाक्षिता पित्तसमानलिङ्गाऽसाध्या प्रदिष्टा रुधिरात्मिकेयम् ॥ ५४

कोलास्थिमात्रः कफसम्भवो यो ग्रन्थिर्गले कण्ठकण्ठकभूतः ।

क्षरः स्थिरः शक्यनिपातसाध्यस्तं कण्ठ्यालुकमिति ब्रूयन्ति ॥ ५५

सुश्रुतसंहिता, निदानस्थानम्, १६ ।

las spreading down the throat or spreading to the mucosa through a tracheal wound); this is hard to cure.

The globular, elevated, congestive, pruritic, slightly suppurative, sweetish and heavy inflammation that is developed in the tonsils, due to the vitiation of '*kapha and the blood*', is called the '*eka-vrnda*' (phlegmonous or suppurative tonsilitis).

The elevated and the globular inflammation that develops with high fever and '*hyperæmia*'; is called the '*vrnda*' (follicular or *lacunar tonsilitis*); if it be of '*vāta*' origin, it causes pricking pain.

The hard tumor that develops causing stricture of the esophagus, due to the corruption of the humors, resembling '*Sataghni*' which is a stone covered with iron pikes, and likewise the tumor that is covered with papillæ, is called the '*sataghni*' (*papilloma*); it is an incurable disease, and it has all the complications of the three corrupt humors (malignant papilloma of the esophagus).

The hard and slightly painful tumor that develops in the esophagus, causing dysphagia, and resembles in appearance and shape the stone of '*Emblia myrobalan*', is called the

'*gilāyu*' (benign fibroma of the esophagus). It is curable by operation.

The tumescence that develops throughout the throat, due to the corruption of the three humors, is called the '*gala-vidradhi*' (*parenchymatous goitre* in which there is a general and uniform enlargement of the thyroids and the vesicles are over-distended with colloid secretion, which however does not escape freely into the lymphatics); it causes all kinds of pain of the corrupt humors, as pricking pain, hyperæmia and pruritis, and has all the complications of an acute abscess (*parenchymatous goitre* may be provoked by septic absorption from a local septic lesion as carious tooth, an ulcer, suppurative tumor or drinking water from a contaminated source).

If such a large tumor develops in the esophagus, due to the corruption of the '*kapha and the blood*,' as to cause aphagia, dyspnea and high fever, it is called the '*galaugha*' (a large *epithelioma* that causes the stricture of the esophagus and the trachea).

The disease in which, due to the stenosis of the trachea, the patient suffers from dyspnea and falls into a swoon, the voice is broken, the throat becomes dry and the patient collapses, is

called the '*svaraghna*' (*stenosis of the trachea* may be caused by many diseases as : (1) enlargement or neoplasm of the thyroids ; (2) enlargement and the tumor of the thymus ; (3) mediastinal tumors or abscesses ; (4) pressure stenosis by aneurism ; (5) tertiary syphilitic lesions).

The disease in which there is an extensive, very painful and continuous inflammation which gradually causes stenosis of the throat, is called '*māmsa-tāna*' (*syphilitic ulceration of the throat*); it is deadly and arises from the corruption of the three humors.

The disease in which there is a bleeding inflammation with pricking pain and hyperæmia and which ulcerates with cadaverous odor, especially on the side the patient sleeps, is called the '*vidārī*' (*syphilitic gangrenous ulceration of the throat*). *Suśruta* II. 16. 56-67¹⁴³.

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143. जिह्वाग्ररूपः श्वयथः कफात् तु जिह्वाग्रवन्धोपरि रक्तमिश्रः ।
 श्लेयोऽधिजिह्वः खलु रोग एव विवर्जयेदागतपाकमेनम् ॥ ५६
 वलास एवायत्सुखतञ्च शोफं करोत्यङ्गगतिं निवार्य्य ।
 तं सर्वथैवाप्रतिवारवीर्य्यं विवर्जनीयं वलस्य वदन्ति ॥ ५७
 गले च शोफं कुस्तः प्रवृद्धौ श्लेष्मानिलौ श्वासरुजोपपन्नम् ।
 मर्मश्चिद्दं दुस्तरमेतदाहुर्वलाससंज्ञं निपुणा विकारम् ॥ ५८
 वृत्तोद्धतो यः श्वयथुः सदाहः कण्डुन्वितोऽपाक्यसूदुर्गुल्ब ।
 गाम्नेकवृन्दः परिकल्पितोऽसौ व्याधिर्वलासज्ञतजप्रसूतः ॥ ५९

Diseases of the Buccal Cavity.

The buccal cavity is covered with ulcers with pricking pain in the '*vāta sarvva-sara*' (*ulcerative stomatitis* or putrid sore of the mouth occurs in oral sepsis, especially associated with carious tooth or pyorrhea).

The buccal cavity is covered with small reddish or dark-yellowish vesicles (small, slightly raised whitish plaques starting as vesicles, surrounded by a red areola) in '*pitta sarvva-sara*' (*aphthous* or *follicular stomatitis*, which is very

स्मुज्जतं वृत्तममन्ददाहं
 तीव्रज्वरं वृन्दमुदाहरन्ति ।
 तच्चापि पित्तक्षतजप्रकोपाद्
 विद्यात् सतोदं पवनात्मजं तम् ॥ ६०
 वर्चिर्धना कण्ठमिरोधिनी वा
 क्षितातिमात्रं पिथितप्ररोहेः ।
 नानारुजोष्णायकरी त्रिदोषाङ्ग
 कृवा शतश्रीष शतव्यसाध्या ॥ ६१
 ग्रन्थिर्गले त्वामसकास्थिमात्रः

संसृज्यते सक्तमिव।यमन्ध
 स शस्त्रसाध्यस्तु गिलायुसंज्ञः ॥ ६२
 सर्ज्वं गलं व्याप्य स्मुत्थितो वः
 शोफो रुजो यत्र वसन्ति सर्व्याः ।

common in infants and young children associated chiefly with indigestion, but also prevails in adults when the general health is impaired).

The buccal cavity (especially on the tongue and the inner margins of the lips) is covered with pruritic, slightly painful and skin-colored

स सर्व्वदोषो गलविग्रहिस्तु
 तस्यैव मुख्यः सलु सर्व्वजस्य ॥ ६३ .
 शोको महान्नजलावरोधो
 तीव्रज्वरो वातगतेर्निहस्ता ।
 कफेन जातो हृदिराम्बितेन
 गले गलौघः परिकीर्यतेऽसौ ॥ ४
 योऽतिप्रताम्यन् शसिति प्रसक्तं
 भिन्नस्वरः शुष्कविमुक्तकण्ठः ।
 कफोपदिग्धेष्वनिलायनेषु
 ज्ञेयः स रोगः शसनात् स्वरजः ॥ ६२
 प्रतानवान् यः शयथुः छक्छो
 गलोपरोधं कुरुते क्रमेण ।
 स मांसतानः कथितोऽजलम्बी
 प्राग्प्रवृत्तु सर्व्वकृतो विकारः ॥ ६६
 सदाहतोऽयं शयथुः सरक्त-
 मन्तर्गले पूतिविधीर्मांसम् ।
 पित्तेन विद्याद्वदने विदारी
 पाश्चै विधेयात् स तु येन येते ॥ ६७
 छद्मसंहिता, निदानस्थानम्, १६ ।

patches in '*kapha sarva-sara*' (*mycotic or parasitic stomatitis* in which small, slightly elevated, pearly white spots are developed through '*saccharomyces (oïdium) albicans*' in debilitated children and old people).

All the symptoms of aphthous stomatitis appears in stomatitis from blood vitiation, and by many authorities, it is called the '*mukha-pāka*' (*acute or catarrhal stomatitis* in which the mucosa membrane of the mouth is more or less extensively reddened, dry and hot, with associated salivation and swelling of the tongue, due to gastro-intestinal disturbances or due to irritants as alcohol or tobacco)" *Suśruta* II. 16. 69-72¹⁴⁴.

144.

स्फोटैः सतोदैर्धदनं समन्ताद्

यस्याचितं सर्व्वसरः स बातात् ॥ ६६

रक्तैः सदाहैस्तनुभिः सपीतै-

र्यस्याचितं वापि स पित्तकोपात् ॥ ७०

कण्डूयुतैरल्परुजैः सबर्णै-

र्यस्याचितं चापि स वै कफेन ॥ ७१

रक्तेन पित्तोदित एक एव

कैरिक्त् प्रदिष्टो मुखप्राकसंज्ञः ॥ ७२

सुश्रुतसंहिता निदानस्थानम्, ११ ।

VI. Tumors.

“*Tumor (granthi), abscess (vulradhi), neoplasm (alaji* perhaps means edema, as *arvuda* has been definitely defined as neoplasm), all develop from *inflammation (Śoṭha)*. They have all their own individual characteristics, and tumors are of various kinds. The swelling that is extensive, slightly elevated, of even or uneven surface, in the skin (including mucous membrane) and the tissues, confined to a part of the body due to a lesion, is called the ‘*soṭha*’ (inflammation).”
Suśruta I. 17. 2¹⁴⁵.

“‘*Śoṭha*’ is of three varieties, ‘*rāyu, pitta and kapha*’. Either they originate from internal causes (in the process of eliminating toxins produced as a metabolic reaction, or, introduced into the economy) or external lesions (as traumatism, microbic invasion or local irritants). Cutting, penetrating, crushing, lacerating, pressing, beating, binding and all kinds of wound and oppression of the tissue cause inflammation; as well as the contact of the (toxic or irritant sub-

145. शोफसमुत्थाना ग्रन्थिबिद्वध्यलजीप्रभृतयः प्रायेण व्याधयो-
 ऽभिधास्यन्ते अनेकाकृतयः, तैर्विलक्षणाः पृथुर्ग्रथितः समो विषमो वा
 त्वक्मांसस्थायी दोषसङ्घातः शरीरैकदेशोत्थितः शोफ इत्युच्यते ।

सुश्रुतसंहिता, सत्रत्यामम्, १७ ।

stances) flower, fruit or juice of '*Semecarpus anacardium*', sting of insects (*mucuna pruritus*) and (penetration) of microbes (*krimi*), at the contact of injurious leaves, vines and bulb (as that of the poison ivy, *Rhus radicans*), the perspiration, or excreta of a poisonous creature, a wound of a poisonous or non-poisonous creature by tooth, horn or nail, poisonous gas (*viṣa vāta*) and fire—all these cause inflammation." *Charaka* I. 18. 1⁴⁶.

"Vomiting, tympanites, cholera, dyspnea, asthma, diarrhoea, tuberculosis, anemia, gastrointestinal troubles, menorrhagia, fistula-in-ano, and piles by osmosis (*ati-karṣaṇa* = excessive pressure) cause (edematous) inflammation." *Charaka* I. 18. 4⁴⁷.

When the tissues are injured by mechanical

146. अथः शोथा भवन्ति वातपित्तकफनिमित्ताः । ते पुनर्द्विविधाः निजागन्तुभेदेन । तत्र आगन्तव्यश्चेद्वदनभेदनक्षानभञ्जनपिच्छनोत्पेयश्वेष्टन प्रहारवधवन्धनव्यधनपीडनादिभिर्वा । भङ्गातकपुष्पफलरसात्मगुसायूकक्रिमि-यूकाहितपत्रलतागुल्मसंस्पर्शनैर्वा स्वेदपरिसर्पणावमूत्रशैर्वा विचित्रा । सविषाविषप्राशिदन्तविषाशनलनिपातैर्वा सागरविषवातद्विम्बदहनसंस्पर्शनैर्वा शोथाः समुपजायन्ते ॥ तरकसंहिता, सूत्रस्थानम्, १८ ।

147. छर्द्यससकविसूचिकाश्वासकासातीसारयोषपायदुरोगोदरप्रदभ्र-न्दुरार्योविकारातिकर्षणैर्वा । तरकसंहिता, सूत्रस्थानम्, १८ ।

agents, or, by chemical, thermic or bacterial irritants or their toxins, inflammation sets in as a restorative process of the tissue repair.

When a mechanical agent has produced a cut, the edges of the wound are slightly separated, and the open vessels are bleeding. The first reactions will arrest the hemorrhage. On the one hand, the calibre of the vessels will contract in consequence of the direct excitation of the nonstriated muscular fibers entering into the structures of their walls, and on the other hand as the result of reflex constriction. The blood flowing with less force, will coagulate ; fibrine will be formed, and its effect will be to occlude the vessel, to assure hemostasis and to unite the edges of the wound, and then serve as a nutrition and as a guide to cells which will insure reparation. This commences when the cellular elements lining the wound begin to proliferate and form a cicatrix. To facilitate the work, the leucocytes rush in, some to take part in the formation of the tissues and others to carry away the dead cells. This causes *inflammation*.

The same phenomenon occurs, with a chemical irritant or toxin ; if it be weak and diluted, it might be absorbed and neutralized without any perceptible local reaction. But if it is

strong enough to destroy a few cells, then there is a vaso-dilatation, a serous exudation (*edema*) to dilute the toxin and to prevent its absorption.

But if these wounds are not kept in aseptic condition, the ubiquitous pus coccus (*staphylococcus* or *streptococcus*), finding favourable medium, starts a colony. It not only multiplies rapidly, but also engenders toxins which cause death of the cells of the region, thus creating a necro-biotic area, surrounded by a proliferative zone of the healthy tissues. Struggle now begins between the invading hosts and the healthy tissues. If the victory is quick with the latter, then the inflammation gradually subsides. But if the tissues lack the resisting power and the bodily defensive mechanism is not powerful or prompt in its response, then leucocytes circumscribe the infection, round the dead cells, so that the general economy can not be affected, and they can fight more conveniently against the microbes and replace the fallen defenders. Coincidentally the nervous terminations are aroused by the microbic toxins and their excitation gives rise to a series of reflex acts which ending in the active dilatation of the vessels of the invaded area, are follow-

ed by migrations of the leucocytes and the formation of the serous exudate. If the pus cocci gain the upper hand, the cells that are killed undergo liquefaction and are converted into the *pus*, so that an *abscess* results. This soon coagulates and a creamy substance is formed which softens towards the centre. And if it be not now evacuated, the softened area increases in size, the skin over it is thinned and mortified, and a small slough is formed, through which the pus escapes and the tension is relieved. If the pus cavity contains a ropy fibrile core, as in a boil or carbuncle, it indicates that the cells have been destroyed in mass by a virulent agent, and of the dead cells, the core is composed. After the escape of the pus, a space—the abscess cavity, is left, the walls of which are lined with vascular or granulation tissues, which escaped destruction, and which slowly fill the contracting cavity and obliterate it by forming interstitial *scar-tissues*. But if the abscess be deeply situated and be not able to open on to a free surface, thus allowing the pus to be drained off, the phagocytes mobilize all their forces, surround the necrotic area and make an advance from all sides. The vanguard of the advancing army is

composed of a more or less compact layer of the mono-nuclear phagocytes (*polyblasts*) accompanied by numerous new vessels which bring the food-supply for the phagocytic scavengers who voraciously ingest all the enemy microbes as well as the injured and dead cells, and carry out their removal from the fighting zone. They also drain off the toxic fluid of the disintegrating cells. Behind the polyblasts, are seen in mighty battle array, the fibroblasts or connecting tissue cells in active proliferation, and with their fibrous laminæ shut off the abscess from the healthy tissues, and with the absorption of the pus, encroach on the pus area. With the absorption of the pus, the abscess cavity is replaced by the fibrous tissue, forming the cicatrical scar. But in case the phagocytes lack the necessary vitality for the operation, the abscess burrows through and forms a dangerous fistula (*visarpa nāḍī*).

Tumors are developed in these eight places : skin (pustular inflammations : acne, ecthymoses, variola ; subcutaneous inflammation : erysipelas, eczema ; vesicular lesions (herpes) or bullæ varicella, pempigus), flesh (*myxoma* = tumor of mucous tissue ; *fibroma* = tumor of fibrous tissue ; *lipoma* = tumor of adipose tissue ; *myoma* = tumor

of muscular tissue), vessels (*angioma*—tumor composed of blood vessels ; *endothelioma*—tumor originating from the endothelium or lining cells of the vascular tissue ; *hemangioendothelioma* = tumor of endothelium of the blood-vessel ; *lymphangioendothelioma* = tumor of the endothelium of the lymphatic vessel ; *endothelioma* = tumor composed of both endothelial and muscular elements ; *lymphangioma* = tumor of the lymphatic vessels ; *aneurism* = a blood-containing tumor connecting directly with the lumen of the artery or formed by circumscribed enlargement either axial or lateral, of an artery) ligament (*snāyu* perhaps included soft cartilage: *chondroma* = cartilaginous tumor), bone (*osteoma* = bony tumor ; odontoma = tumor of dental structure), joints (*arthromeningitis* = inflammation of the joints ; synovitis = inflammation of the synovial membrane, especially that of a joint), nerve (*snāyu* : *neuroma* = tumor in connection with nerves ; glioma = neuroglial tumor), viscera (*papilloma*, *adenoma* = epithelial tumors ; carcinoma is malignant) and in vital organs." *Susruta* I. 22. 2¹⁴⁸ .

148. त्वक्मांसशिरास्नाय्वस्थिसन्धिकोष्ठमर्माणोत्पद्यै ब्रणवस्तूनि,
अथ सर्वब्रणसन्निवेशः ॥ २ सुश्रुतसंहिता, सूत्रस्थानम्, २२ ।

"Now we shall describe the exudation of tumors. If the skin is bruised or lacerated, or in skin-tumors (varicella, acne, eczema etc.), whether spontaneously or when lanced, an aquatic, slightly acid-smelling and light-yellowish exudation (serous fluid mixed with sebaceous secretion) comes out. The evacuation of an abscess in the flesh, is like clarified butter, thick, whitish and slimy (*caseous or cheesy pus*—a very thick, almost solid pus resulting from the absorption of the liquor puris). In a recent incision of a blood vessel there is an excessive bleeding from the vascular swelling ; if it suppurates, the pus flows from it as from a water-pipe (*toya-nāḍī*), thin, unmixed, viscous, flaky (caseous flakes consisting of necrosed or sphacelated cells and fatty acids, floating upon the serous fluid) and has a pale brownish color (*serous or curdy pus*). The exudation from a '*snāyu*' (nerve or ligament tumor) is creamy, thick, mixed with blood and is like the mucous from the nose (*phlegmonous or laudable pus* which is a yellowish-white, creamy, thick and odorless liquid). If a bone is wounded or fractured, a kind of pearly white exudation comes out ; but that of an osseous tumor is mixed with bone-marrow, blood and fat (the pus of osseous origin contains fat and often small splinters of

bone). If an inflammatory joint (tumous joint) is pressed, no exudation comes out ; but on contraction, extension, standing on the toes, sitting low, pressure sitting, spasmic tension brings out an exudation which is viscous, flaky, foamy and is mixed with blood and pus (suppurated synovia). From the visceral tumors, are evacuated blood, urine, fecal matters, pus and serous fluid (there may be found in pus foreign bodies, tissue fragments, elastic fibers, animal or vegetable parasites, hydatids, actinomycets, organic liquids, bile, milk, urine, fecal matters and alimentary fragments. Their finding is of great importance from a semiological standpoint, indicating as to the origin of pus and as to the possibility of organic fistula). As to the exudations of the tumors of the vital organs, nothing is mentioned, for they belong to the same category of tumors of the skin and flesh (mucous membrane and the muscular and adipose tissues). *Suśruta* I. 22.

११४९

149. अत ऊर्ध्वं सर्वस्माद्वान् वक्ष्यामः । तत्र पृष्ठास च्छिन्नास वा
 ! त्वज्जु स्फोटितु भिन्नेषु बिदारितेषु वा सलिलप्रकाशो भवत्यान्नायः किञ्चिद्विन्नः
 पीतावभासश्च । मांसगतः सर्पिःप्रकाशः सान्द्रः श्वेतः पिच्छिलश्च ।
 शिरोगतः सद्यश्छिन्नास शिरास रक्तातिप्रवृत्तिः पक्कास च तोयनाडीभिरिव
 तोयागमनं, पूयस्यान्नावश्चात्र तनुर्विच्छिन्नः पिच्छिलोऽवलम्बो श्यावोऽवश्याय-

The color of the pus is no less variable (Susruta IV. 1. 8-17). Usually yellowish, it may be of orange, brownish red or greenish color. There is no suppuration presenting blue color, but it is occasionally seen due to the pigment produced by bacillus pyocyaneus which is not pyogenic by itself. However, there is no relation between the color of the pus and the cause which develops it, but on the locality where it is formed and imbibe the coloring matter, with the only exception of the suppuration of the pneumococcic origin, which is thick, greenish and rich in fibrine, often having the aspect of the false membrane. In subcutaneous or pleural collections the pus is phlegmonous, thick ; in meningeal membranes of the brain, it is greenish ; in the liver, of the chocolate color ; and reddish in the

प्रतिमश्र । आदुगतः क्षिणो धनः सिंहाणकप्रतिमः सरक्तश्च । अस्थि-
गतोऽस्थिव्यनिहते स्फुटितं भिन्नो दोषावदारिते वा दोषभक्षितत्वादस्थि
निसारं शुक्तिश्रौतमिवाभाति । आस्रावश्चात्र मज्जमिश्रः सरधिरः क्षिणश्च
सन्निवगतः दीड्यमानो न प्रवर्त्तते, आकुञ्चनप्रसारणोन्नमनविनमनप्रधावनोत्-
कटासनप्रशङ्खौ च श्रवति । आश्रावश्चात्र पिच्छिलोऽवलम्बी सफेनपूय-
रुधिरोन्मथितश्च । कोष्ठगतोऽष्टुङ्गमूत्रपुरीषपूयोदकानि श्रवति । मर्ममगता-
स्त्यग्नादिप्लवङ्गाद्यान्मोच्यते ॥ ६

lung. When it is of osseous origin, it often contains fat and small splinters of bone. If it takes origin in the glands of the skin, it produces a furuncle or a carbuncle--lesion, remarkable for the presence of sphacelated fragments of the cellular tissue, which constitutes the core.

Pyogenic agents : Pyogenic agents which can cause suppuration are numerous. (1) Bacteria habitually pyogenic : Staphylococcus aureus and albus, streptococcus, pneumococcus, colon bacillus and micrococcus tetragens are normally encountered upon our integuments and though in healthy condition of the tissues they usually live a harmless saprophatic or vegetative life, yet when the tissues are damaged or injured, and therefore are incapable of offering natural resistance to encroachment, they are particularly apt to provoke suppuration. Of them staphylococci are the most common pathologic agents, but take nearly 250,000,000 to 1,000,000,000 of them to provoke an abscess. (2) Specific pyogenic bacteria are yet recognized to be only three, namely : gonococcus, the bacillus of soft chancre and the bacillus glanders. (3) Bacteria accidentally pyogenic are those which cause specific and well differentiated lesions of their own, but may, also, cause suppuration under

certain conditions, as the tubercle bacillus causes cold abscess, and typhoid bacillus pus in the bone. (4) Pyogenic fungi are the streptothrix, pergillus and odium. (5) The animal pyogenic parasites are the amœbas of dysentery which not only provoke ulcerations of the intestinal mucous membrane, but also abscesses in the liver, and the syphilitic spirocheta which may cause gumma and its ulceration. Gangrene is the morbid process characterized by the mortification (*necrobiosis*) and the putrefaction of the tissues. The microbes causing gangrene act upon the altered tissues by interrupted circulation, by humoral changes or by the interference of the arterial circulation, especially in the extremities exactly as they would act upon the tissues of the cadavers. But between gangrene and the cadaveric putrefaction, there is this difference, that in the gangrene, the affected parts are still the seat of certain biotic reactions, as all the cells are not equally attacked by the bacteria and quite a few survive; and moreover, there is partial influx of serum, lymph, venous blood and blood pigments and the bacteria attacking the exudate produce new fermentations therein.

“The ingestion of heavy, unsuitable, dry, rotten, or disharmonious combinations of foods,

venery, excessive exertion (fatigue), retention of the feces and the urine, and inflammatory beverage provoke bulbous abscess like an ant-hill, either by particular lesion or by their combined effects. In the anus, neck of the bladder, abdomen, axilla and the groin (*bubo*-an inflammatory swelling of the lymphatic gland, usually leading to suppuration), kidneys (*vrkka*), spleen, liver and the lung abscesses are formed with the symptoms of superficial abscesses (*furuncles or boils*)” *Suśruta* II. 9. 13-14¹⁵⁰.

“In abortion or injurious delivery, a woman suffers with fever ‘hyperæmia’ from dangerous blood-abscess (*rakta-vidradhi* = *septicopyemia* : if the entire organism is invaded by bacteria which are usually introduced through the septic handling of the genital puerperal wounds, it is

150. गुर्वसात्म्यविरुद्धाश्च शुष्कसंक्षिप्तभोजनात् ।
 अतिव्यवयव्यायाम-वेगाघातविदाहिभिः ॥
 पृथक् सम्भूय वा दोषाः कुपिता गुल्मरूपिणम् ।
 वलमीकवत् ममुन्नद्धमन्तः कुर्वन्ति विद्रधिम् ॥ १३
 गुदे वस्तिमुखे नाभ्यां कुक्षौ वल्लग्नयोस्तथा ।
 वृक्कयोः प्रोष्ठं यकृति हृदये क्लोम्नि वा तथा ॥
 तेषां लिङ्गानि जानीयाद्वाद्यविद्रधिलक्षणैः ॥ १४

सुश्रुतसंहिता निदानस्थानम्, ६ ।

called *septicemia* ; but if the purulent foci are developed as the abscesses in the liver, kidney, lungs, heart etc. which are known as metastatic abscesses, it is called *pyemia*. In the transitory stage of both these morbid processes, it is often called *septico-pyemia*. However septicemia and pyemia are both usually attended by fever, diarrhoea and other symptoms of malaise according to the virulence of the infection and the bodily reaction)". *Suśruta* II. 9. 20¹⁵¹.

"If any one neglects a suppurated abscess, it burrows through to an interior organ, and as it proceeds like a tube, it is called '*nāḍī-vraṇa*' (*fistular abscess*)."
Suśruta II. 10. 9¹⁵².

151. स्त्रीणामपप्रजातानां प्रजातानां तथाऽहितैः ।

दाहज्वरकरो घोरो जायते रक्तविद्रधिः ॥

सुश्रुतसंहिता, निदानस्थानम्, ६ ।

152. शोफं न पक्वमिति पक्वमुपेक्षते यो

यो वा ब्रणं प्रचुरपूयमसाधुवृत्तः ।

अभ्यन्तरं प्रविशति प्रविदार्य्य तस्य

स्थानानि पूर्वविहितानि ततः स पूयः ॥

तस्यातिमाग्नगमनाद्गतिरित्यतश्च

नाडीव यद्वहति तेन मता तु नाडी ॥ ६

सुश्रुतसंहिता, निदानस्थानम्, १० ।

“When a rounded and knotted swelling is developed by the corruption of the *‘vāta, flesh, blood, serous fluid and the fat’*, it is called *‘granthi’* (cyst).

In the *‘vāta-granthi* (aneurism), pains are felt with the sensation that the cyst is being elongated by a gravitating force (expulsive pain), that it is being torn (terebtant p.), that it is being penetrated by needles (boring p.), as if dashed out (tensive p.), as if being lanced (lancinating p.) or lacerated (lacerating pain); it is dark and shaped like the bladder, and if it bursts, pure blood comes out of it (aneurism is a blood-containing cyst formed by circumscribed enlargement of an artery through which the blood circulates. Such cysts are distinguished by their expansive pulsation with each systole of the heart, by a thrill to be felt on palpation and by a *‘bruit’* heard on auscultation. As they increase in size, they produce absorption of adjacent structures and give rise to distressing pain by their pressure on nerves, and their final tendency is to burst, and if a large artery is the seat of the cyst, to cause death).

In *‘pitta-granthi’* (hemangioma), there is hyperemia, and the pain seems to be like that of the application of caustics and cautery: the

cyst is of reddish or dark-yellowish color, and if it bursts, very hot blood comes out (*hemangioma* is a blood swelling or cyst due to the dilatation of the blood vessels).

The '*Kapha granthis*' (*tubercles*) are cold, pale, slightly painful and are hard like stone, and take a long time for their growth (suppuration); when they burst, a thick whitish pus comes out of them); *tubercles* are called cold abscesses or they arouse no local or general reaction. Tubercles appear under three different aspects; gray granulation, Laenneck's tubercle and caseous mass. Gray granulation is a small, hard and non-nuclear nodule, surrounded by a reddish vascular zone and their dimensions vary from 0.5 millimeter to 2 or 3 millimeters. Laenneck's tubercle is more voluminous; it is a round, gray or yellow mass, having the volume of a pea, a hazelnut or a walnut. The caseous masses are greenish-yellow deposits and look like Roquefort cheese. The tubercular abscess may also arise from the breaking down of a tubercular lymphatic vessel).

The '*Meda-granthi*' (*lipoma*) is bright, voluminous, slightly painful, but pruritic; it grows with the adiposity of the body, and declines with its decrease; if it bursts, fat like that of the

kernel of the sesame or like clarified butter comes out (*lipoma* is a tumor of the fatty tissue, and grows in the subcutaneous tissues, especially in parts subjected to pressure—the shoulders and the buttocks, the abdominal wall and the breast, though it may be present in tissues containing very little fat as the dura matter, submucous tissue of the intestine, as a single or multiple flattened, rounded or pendiculated growth. When large it is always lobulated. The yellowish tissue of the lobules is usually softer and more plastic than the ordinary fatty tissue).

The '*Sirā-granthi*' (*cirroid aneurism*) is developed by the derangement of '*vāyu*' in a weak person through wrestling which causes arterial distension, distortion or contortion and elevates them (the arteries) like lotus stems, and makes of them roundish tumors ; if these tumors are painful and temporary, they can be cured with difficulty, but if they are painless, permanent, voluminous or developed in the vital organs, they are incurable (*cirroid aneurism* is a tumor-like collection of dilated and elongated arteries. In the majority of cases, aneurisms are due to weakening of the arterial walls by arteriosclerosis. If the latter is diffuse, the dilatation

is generally fusiform and irregular ; if circumscribed, the yielding is succular. Of the causes of the sclerotic changes, syphilis is the most important in producing aneurism. Prolonged high arterial tension as in laborious muscular work, cardiac hypertrophy, a great and sudden strain as in heavy lifting, violent coughing or straining may initiate the dilatation if, the coats are weakened by previous disease).

At the maxillary, clavicular, axillary, humero-ulnar (and radial, i. e. elbow), scapulo-clavicular (back-neck), and hyoid-thyroid-cartilaginous (front neck) joints, due to the accumulation of fat, a solid and rounded tumor (*exostosis or osteoma*) or causes slightly painful fatty and serous inflammation ; if the tumor resembles the stone of myrobalan or the fish-roë, or any such similar substance and has the color of the skin, it is called '*apachî*' (*exostosis*) because of its swelling. Exostosis is pruritic and slightly painful ; some of them (*exostoses*) exudate when torn (or incised). It lasts for a long time, its nodules being destroyed and renewed. This disease develops from '*fat and kapha*' and is very hard to cure (*osteomas* and *osteomatoid* conditions, in which there is localized or general overgrowth of the bone, are of

common occurrence. Both groups are found chiefly at the point of junction of a bone and its cartilage, fasciæ, periosteum, tendons and the ligaments, in the pia matter and the dura matter in the choroid and sclerotic coats of the eye at the apex of the lungs, in the skin and the mucous membrane, and sometimes even in the penis and in muscular tissues. They are usually divided into two groups, the exostosis, or those growing from the surface of the bone, and enostoses or those growing within the bone. And again they may be divided according to their structure, into eburnated exostosis intensely hard like that of the cement of the tooth and spongy or cauliflower exostosis).

Due to some lesion, the tissues become affected, and a rounded, solid neoplasm slightly painful, voluminous, and deep-seated but with slender base, grows without suppuration ; it is called *arvvuda* (*tumor, neoplasm or cancer*).

Due to contraction of the blood-vessels and the blood, owing to a papilliferous, slightly ulcerative and exudative meat-ball (*neoplasm*) is firm which, grows rapidly and causes incessant bleeding. This is called '*rakta-arvvuda*' (*papilloma*). Due to the complications (sequels) arising from the loss of blood, the papilloma

victim becomes anemic. It is an incurable disease (*papilloma* is any abnormal excrescence having a villous structure, but more properly a tumor of the skin or of the mucous membrane, either sessile or pedunculated, consisting of hypertrophied or new-formed papillæ, covered by an envelope of the epithelial cells separately on each papillæ, so as to produce a villous or filiform appearance. Papilloma is usually benign but if neglected, it may form the starting point or be converted into benignant '*epithelioma*'. Also a destructive papilloma is known which is probably a carcinomatous form, and which is ulcerative and in which the papillary growth upon the surface extends into and destroys the subjacent tissues.

If any part of the body is lacerated by a blow, there is developed a painless, bright, skin-colored, non-suppurative, stone-hard and fixed tumor, due to the lesion of the tissues; and it is called *māṃsa arvva*, (*myxoma* usually occur in submucous, subcutaneous or other connective tissues in the intermuscular septa between the bundles of nerves, in periosteum and in subserous fat, and has the general character of tumors of this group). If a myxoma victim partakes of meat, this tumor becomes thickened

and incurable. And of the benign-symptomatic tumors those which are infiltrative (or malignant breast tumors) are incurable.

Of the above-mentioned tumors those which are exudative or develop in the vital organs or in the vessels (arterial, venous, lymphatic or nervous) or those which do not move (suppurate ?) are incurable. If a new tumor develops on another, it is called '*adhyarvvuda*' (secondary or proliferation tumors that develop adjacent to each other as pairs are called '*dvirarvvuda*' (double tumors). It is also incurable".
 "Sūśruta II. 11. 2-15.¹⁵³

153. वातादयो मांसमसृक् प्रदुष्टाः सन्तूप्य मेदश्च कफानुबिद्धम् ।
 वृत्तोन्नतं विप्रथितन्तु शोथं कुर्वन्त्यतो ग्रन्थिरिति प्रदिष्टः ॥ १५३
 आयम्यते व्यध्यत एति तोदं प्रत्यस्यते कृत्यत एति भेदम् ।
 कृष्णोऽमृदुर्वस्तिरिवाततश्च भिन्नः स्रवेद्यानिलजोऽस्रमच्छम् ॥ ३
 दन्द्यते धूप्यति चातिमात्रं पापच्यते प्रज्वलतीव चापि ।
 रक्तः सपीतोऽप्यथवापि पित्ताग्निश्च स्रवेदुष्यामतीव चाक्षम् ॥ ४
 शीतोऽबिक्वर्णोऽल्परुजोऽतिकण्डूः पाषाणवत् संहननोपपन्नः ।
 विराभिवृद्धिश्च कफप्रकोपाग्निश्च स्रवेच्छुक्लवनप्लव पूयम् ॥ ५
 शरीरवृद्धिश्च वृद्धिहानिः स्निग्धो महानल्परुजोऽतिकण्डूः ।
 मेदःकृतो गच्छति चातिभिन्ने पित्तयाकसर्पिःप्रतिमन्तु मेदः ॥ ६
 व्यायामजातैरवलस्य तैस्तैराक्षिप्य वायुर्हि शिराप्रतानम् ।
 संपीक्य सककोच्य विशोष्य वापि ग्रन्थिं करोत्युन्नतमाशु वृत्तम् ॥

"A neoplasm or tumor is a new formation of tissue, which is atypical in structure, serves no useful purpose in the whole economy and the growth of which has no typical termination." According to Cohnheim there remains in the adult enough of unappropriated embryonic residues which if activated by any mechanical or microbic irritant outstrip the normal calculus growth and form a tumor possessing an unutilized and consequently an exaggerated power of proliferation. But the cells of the malignant neoplasms are themselves capable of starting new growths (*metastases*) if carried to

ग्रन्थिः शिराजः स तु कृच्छ्रसाध्यो भवेद्यदि स्यात् सरुजश्चलश्च ।

अरुक् स एवाप्यचलो महान्श्च मर्मोत्थितश्चापि विषज्जनीयः ॥ ७

हन्वस्थिकक्षाक्षकवाहुसन्धि-मन्यागलेषूपचितन्तु मेदः ।

ग्रन्थिं स्थिरं वृत्तमथायतं वा क्षिप्य कफश्चाल्परुजं करोति ॥ ८

तं ग्रन्थिभिश्चामलकास्थिमात्रैर्मत्स्याण्डजालप्रतिमैस्तथान्यैः ।

अनन्यवर्णैरुपचीयमानं चयप्रकर्षादपर्चीं वदन्ति ॥ ९

कण्डूयुतास्तेऽल्परुजः प्रभिक्ताः स्रवन्ति नश्यन्ति भवन्ति चान्ये ।

मेदःकफाम्बां खलु रोग एष सुदुस्तरो वर्णगणानुबन्धी ॥ १०

गात्रप्रदेशे कचिदेव दोषाः संमूर्च्छिता मांसमसृक् प्रदूष्य ।

वृत्तं स्थिरं मन्दरुजं महान्तमनल्पमूलं चिरवृद्धपाकम् ॥

कुर्वन्ति मांसोपचयञ्च शोफं तद्वन्बुद्ं शास्त्रविदो वदन्ति ।

सुश्रुतसंहिता, निदानस्थानम्, ११ ।

distant parts by circulation, as a malignant tumor of the breast may start new cancers far removed from the original lesion into the lungs, ribs, brain and the abdomen through the lymphatic current. No microbic agent has yet been definitely identified with the tissues of the malignant tumor, though '*micrococcus neoformans*' has been found in both benign and malignant neoplasms. However, the probability is that there is a specific pathogenic cancerous agent. Fortunately all neoplasms are not dangerous. The benign tumors are entirely harmless unless they are situated in a sensitive position, where by their growth they might cause pressure on the nerves or displace the vital organs. And they never reproduce themselves in distant parts by grafting like the malignant growths. And the fundamental difference between the two types, though the process of their growth has the same tendency of exaggerated, abnormal proliferation and multiplication of their own cells, lies in the fact that the benign tumor does not eat its way into the surrounding tissues, but remains closed in its own fibrous capsule. While a malignant tumor infiltrates into the neighboring tissues, causes destruction of the healthy cells, creates an ulcerative zone and therein transplants a new colony.

But only sarcoma, endothelioma and carcinoma are malignant. However, between benign adenoma and malignant epithelioma there exist numerous transitions, and under certain circumstances, a benign tumor may turn into the malignant type as '*destructive papilloma*'. And though tumors may be observed in all ages, yet their frequency and nature vary considerably at different periods of life. In the defective development of the embryo, angiomata are frequently met. During early life sacromata are observed, located chiefly in the kidneys. At puberty exostoses are frequent. In women at a later period, ovarian cysts belonging to the group of adenomata and epitheliomata are encountered. From the age of fourteen onward, epithelioma becomes more and more common, reaching its maximum of frequency between the age of fifty and fifty-five years. Age exercises no less influence upon the localization than upon the nature of the tumors. In children, they affect, in order of frequency, the eye where melanotic sarcoma is met with, the kidney, testicles and spleen. In adults the part of the body most frequently attacked is the stomach, uterus, liver, mamma and the intestine in the order mentioned. It is certain that the irritation alone,

microbic or mechanical, is not sufficient to develop tumor unless the organism is predisposed to it by heredity, or has acquired this characteristic through some morbid process of pathogenesis which is not yet understood.

The abscess (*Vraṇa*, *furuncle*, boil or carbuncle, differs from the furuncle or the boil in various points. (1) It generally occurs singly and usually appears at the back of the neck, the back or the buttocks. (2) It is very large in size like a hen's egg or even larger. (3) It contains more than one core (necrotic tissue or suppuration points as in furuncle), due to (corruption) of the 'vāyu, pitta, kapha and the blood', produces intense burning, throbbing, tremulous and pricking pain, hyperæmia, suppuration, redness, swelling and hyperæsthesia; and it causes various kinds of pain and exudation." *Suśruta* IV. I. 20¹⁵¹.

"There are sixty treatments of 'vraṇa' (suppurative tumor, especially furuncle) as follows: fasting (*apatarpaṇa*) to facilitate the elimination of the toxic and the effete matter circulating in

154. निर्हृन्निर्मथनस्फुरणतोददाह पाक-राग-क्रादू-स्वाप-बहुलो नाना-
व्यवेदनाभ्रावविशेषोपेतः पवनपित्तकफयोशितेभ्यः ॥ २०

सुश्रुतसंहिता, चिकित्सास्थानम्, १ ।

the blood which predisposes the tissues to pyogenic infection), *epithem* (*ālepa*, to spread over the boil to relieve pain, congestion, to focalize the inflammation and to bring out suppuration), *lotion* (*pariṣeka*, to wash the inflamed part for asepsis and to relieve pain), *salve* (*abhyāṅga* to smear over as an antiseptic and analgesic), *fomentation* (*śveda*, as an analgesic and suppurantia), *emollient* (*vimlāpana*, to soften and beat the boil), *cataplasm* (*upanāha*, as a suppurantia), *suppurantia* (*pāchana*, to cause early suppuration), *leeching* (*visrāvāṇa*, to apply sucking leeches to relieve congestion), *emulsion* (*sneha*, as a stimulating nourishment), *emetic* (*vamana*, to remove gastric irritants), *dissection* (*chhedana*, to remove the ulcerative parts of a non-suppurative tumor), *incision* (*vedana*=lancing to cause the drainage of the pus), *scarification* (*dāraṇa*, to soften the skin so as to cause spontaneous bursting of the abscess in the timid women and children who are afraid of lances and incision), *evacuation* (*lekhana*, to scratch and to wipe out the impacted caseous pus from the abscess cavity), *exploration* (*eṣaṇa* to find out the nature of the abscess cavity in a fistula), *extraction* (*āharaṇa*, to extract any foreign body from an abscess), *puncture* (*vyadhana*,

exploratory puncture of a cavity or a tumor with a hollow needle to determine the presence or absence of fluid or gas, and its nature, if present), *suction* (*vidrāvāṇa*, to suck the liquid pus and exudation from an abscess cavity or serous fluid from hydrocele or ascites through a tube by exhausting the air in the front), *suture* (*sivana*, to reunite by stitching a wide-gaping, non-suppurative wound with a silk-thread), *appositional reunion* (*sandhāna*, to put the wounded and operated parts in their proper place and to unite them together), *compressive epithem* (*pīḍana*, an epithem that draws the pus to the surface), *hemostatic* (*śoni'āsthāpana*, to arrest bleeding of a wound), lenitive (*nirvvāpana*, to soothe and to relieve irritation), medicinal *fomentation* (*utkārikā*, to provoke suppuration), *antiseptic astringent* (*kaṣāyā*, to cleanse the wound-cavity), *collyrium* (*vartti*, as disinfectant), *mucilaginous paste* (*kalka*, as a disinfectant), *ointment* (*ghṛta*, as depurant), *oil* (*taila*, as depurant), *chemical action* [*rasa-kriyā*, of sesame decoction, thickened and made into paste with the mixture of iron sulphide (*surāṣṭrajām sakāśisām*), *arsenic disulphide* (*manahśilā*) and *arsenic trisulphide* (*haritāla*)] to be applied to the abscess—*Sutruta* IV. I. 59], fine bland

powder (*avachūrṇana*, as a deodorant), *fumigation* (*vraṇa-dhūpana*, to expose the abscess cavity to medicinal gases), *vulnerary* (*ulsādana*, to promote healing and cicatrization), *inunction* (*avasādana*, to promote tissue formation and normal circulation in the cicatrized area), *emollient* (*mṛdu-karma*, to soften the skin), *tissue-hardener* (*dāruṇa karma*, to harden the tissues with tannic astringents), caustic (*kṣāra-karma* destroy a long standing ulcer, which is hard to cure), *cautery* (*agni-karma*, to scar the ulcerated tissues which do not easily cure, especially in the bladder and the joints), *pigmentary* (*kṛṣṇa-karma*, to promote pigment cells in the pale cicatrised area), *pigmento-lysin* (*pāṇḍu-karma*, to destroy the pigment, in order to bleach the darkened area), *pigment-normalizer* (*pratisāraṇa*, to normalise the skin-color of the affected area), hair-grower (*roma-sañjanana*, to promote the growth of hair, where the hair follicles have been destroyed), *depilatory* (*lomāpaharaṇa*, to cause the falling out of hair where it is not desirable, or by shaving), *clyster* (*vasti-karma*, as an antiseptic injection in a deep-seated abscess), *irrigation* (*uttara-vasti*, to wash out the purulent deep-seated abscess cavity), *bandage* (*vanda*, to protect the wound from microbic infection),

plaster (*patra-dāna*, as a pepastic), *germicide* (*krmighna*, as a destructive agent of the microbes), *detoxicants* (*viśaghna*), *stimulants* (*ormhāna*, to activate the organism to fight against the disease, to throw off the toxins and to restore health) *sedatives* (*śiro-virechana*, to remove congestion from the upper parts of the body, in case of abscesses there), *snuff* (*nasya*, as a sedative), *mouth-wash* (*kavala-dhūraṇa*, as a disinfectant in stomatitis), *fumigation* (*dhūma*, exposure to the action of a disinfectant smoke), *analeptic* (*madhu-sarpi*, a restoration), *operation* (*yantra*, to operate where there is a foreign body in the wound and its mouth is narrow), *dietary* (*āhāra*, light and stimulating foods), and *hygiene* (*rakṣā-vidhāna*, as curative and preventive). “*Suśruta* IV. 1. 22. ; 59^{1.5.5}.”

155. तस्य ब्रणस्य षष्टिरूपक्रमा भवन्ति । तद्वयथा—अपतर्पणमालेपः
परिषेकोऽभ्यङ्गः स्वेदो विम्लापनमुपनाहः पाचनं विस्त्रावणं स्नेहो वमनं
विरचनं छेदनं भेदनं दारणं लेखनमेपणमाहरणं व्यधनं विद्रावणं सीवनं
सन्धानं पीडनं शोषितास्थापनं निर्व्वापणमुत्कारिका कषायो वर्त्तिः कल्कः
सर्पिस्तैलं रसक्रियावचूर्णं ब्रणधूपनमुत्सादनमधसादनं मृदुकर्म दाह्यकर्म
क्षारकर्म्माम्लिकर्म कृष्णकर्म पाण्डुकर्म प्रतिसारणं रोमसञ्जननं लोमाप-
हरणं वस्तिकर्म्मोत्तरवस्तिकर्म्म बन्धः पत्रदानं कृमिघ्नं वृंहणं विषघ्नं
शिरोविरचनं नख्यं ककलधारणं धूमो मधुसर्पिर्वन्तमाहारो रक्ताविधानम्
इति ॥ २२

सुश्रुतसंहिता, चिकित्सितस्थानम्, १ ।

"After the above-mentioned treatment, if the inflammation is found to be of a suppurative kind, then by the application of a pustulant, it has to be made to suppurate, then lanced and disinfected." *Suśruta* IV. 16. 4¹⁵⁶.

Etiology : Furuncle or boil is not possible without the infection of staphylococcus pyogenes aureus which is invariably found in the pus. This gives rise to acute inflammation and exudation, leading to necrosis of the tissue. The infection of the staphylococcus pyogenes aureus is favored by the impairment of the tissue vitality, which is the natural consequence if the blood contains toxic, irritant or effete matters. In that case, the tissues are not only ill-nourished, and therefore incapable to offer natural resistance to microbic invasion, but

ब्रह्मानां स्थिरमांसानां कुप्याद्बुद्ध्यैस्वीरितैः ।

कषायैर्विधिषत् तेषां कृते व्यामिश्रयेत् पुनः ॥

उराट् जां सकासीसां दद्याच्चापि मनःशिलां ।

हरितालम्ब मतिमांस्तस्तामवधारयेत् ॥ ५६

सुसुतसंहिता, चिकित्सितस्थानम्, १ ।

156. वेद्यवारैः सङ्गच्छरैः पयोभिः पायसेक्षया ।

खेदक्षेत सततञ्चापि निङ्गुञ्जापि प्रीणितम् ॥ १

सुसुतसंहिता, चिकित्सितस्थानम्, १६ ।

especially when the kidney fails to eliminate the effete and the toxic substances in the blood, the burden falls on the skin as an emunctory organ. This naturally irritates the skin and predisposes it to the infection of staphylococcus which is ubiquitous causing furuncles, boils and carbuncles. And they are usually associated with the diseases, especially if the renal functions have been impaired, as in chronic dyspepsia, gout, rheumatism, scrofula, tuberculosis, diabetes and albuminuria. It is frequently met with in dyspepsia in which there is insufficiency or deficiency of the pepsin and the trypsin, especially the latter, leading to albuminous putrefaction, whose toxic products are absorbed into the blood, and are thrown over to the skin for elimination when the kidney alone is not equal to the task.

Therefore special attention should be paid to dietary and cleanliness. Fresh, healthy, wholesome light and easily digestible food should be taken in restricted quantity, especially of the albumins. All irritant foods, drinks and spices must be avoided. Whey or butter-milk which by its lactic acid producing content (*lactose*) counteracts putrefaction by changing the culture medium of the proteolytic bacteria is a very

preferable addition to the diet, or an exclusive diet for a few days.

“A ‘*śleṣma*’ tumor which has not been remedied by any application, and which has not grown in any vital organ, should be dissected, extirpated, in its premature state. the wound cauterized and treated as any fresh wound. *Suśruta* IV:18. 8¹⁵⁷.”

“A tumor in its premature state (that is, it should be operated as early as possible) should be excised and cauterised. Or as according to the previous insrtuction, it should be scratched out, and the caustics should be applied to the wound. “*Suśruta* IV. 18. 16¹⁵⁸.”

“If the neoplasm is not deep-rooted, then with a (wire) of tin (*trapu*), copper, lead or silk (cord) it should be surrounded, and carefully

157. असमंजसात् शूलमप्रजातमपक्वमिवापहरेद्दिदार्यम् ।

दृष्टेत् स्थिते वासृजं सिद्धकर्मो सद्यःक्षतीक्ष्णश्च विधिं विदध्यात् ॥ ८

सुश्रुतसंहिता, चिकित्सितस्थानम्, १८ ।

158. यन्धीनमर्चप्रसवानपकागुह्यं चापि विदधीत पश्चात् ।

आरेण वापि प्रतिसारयेत् तु रंलिख्य शस्त्रेण यथोपदेशम् ॥ १६

सुश्रुतसंहिता, चिकित्सितस्थानम्, १८ ।

the physician should use the knife, caustic or cautery, according to the strength of the patient. *Suśruta* IV. 18. 29^{154a}.

“If any part of the neoplasm remains and is not completely extirpated, then from the remnant the neoplasm reappears, as fire can grow from a small spark left-over; therefore all the growth (of the neoplasm) must be extirpated”. *Suśruta* IV. 18. 33¹⁵⁵.

There is no question that the complete extirpation of either the benign or the malignant neoplasm is the best remedy, wherever possible, that is when they have not developed with a deep base in any vital organ.

VII — *Skin Disease.**

Prodromes of Leprosy :—“The thickening of

158a. यदल्पमूलं यपुतावसीस-पट्टैः समाविष्टा तदायसौर्वा ॥

चारःप्रिगन्त्राण्यसज्जद्विदध्यात् प्रणानङ्गिसन् भिषगप्रलप्तः ॥ १८

सुश्रुतसंहिता, चिकित्सितस्थानम्, १८ ।

159. सशेषदीर्घाणि हि योऽर्जुदानी करोति तान्वाय पुनभवान्ते ।

तस्मादशेषाणि समुद्धरेत् तु हन्युः सशेषाणि यथा हि वज्रः ॥ १९

सुश्रुतसंहिता, चिकित्सितस्थानम्, १८ ।

* The writer regrets that he lacks the clinical ex-

the skin, sudden horripilation, pruritus, hyperidrosis or anhidrosis, anesthesia of the skin, the extension of ulceration if any wound takes place, and the dark color of the blood are the prodromes of '*Kuṣṭha*' (leprosy)." *Suśruta* II. 5. 2¹⁶⁰.

"In the '*vāta*' leprosy, the lepromes are brownish and slender with boring pain and anesthesia; it is called '*aruṇa*' sun-colored '*lepra flava*'. In the '*pitta*' leprosy, the nodosities are like the

perience of skin disease, especially the tropical dermatosis, and the diseases of the genital organs. His knowledge is limited to the studies of authorities on these subjects. And moreover as the cutaneous manifestations are hard to identify without the associated symptoms, and both Charaka and Suśruta have given vague description of them, only those diseases will be mentioned which have a direct bearing on the history of syphilis in ancient India. It is very likely that the papulo-squamous syphilide, pustulo-crustaceous syphilide, tubercular syphilitic dactylitis, exostoses, osteo-periostitis, nodes, gummata and ulcerations have been classified as leprous manifestations or varieties of leprosy.

160. तस्य पूर्ववत्पाणि तद्वत्पादभ्रमकजाद्रोमहर्षः कब्धुः खेदबाहुल्यमखेदनं
अङ्गप्रदीर्घाणां क्षापः अतविषर्पभ्रमसूत्रः कृच्छता चेति ॥ २

[सुश्रुतसंहिता, निदानस्थानम्, ५ ।

ripe fruit of '*ficus glomarata*'; this is called '*audamvara*' leprosy (*lepra nodosities*, rounded, hemispherical, varying in size from a pin's head to a hazel-nut, hard and elastic to the touch, pale-red or brown in color, may appear from the beginning without any antecedent patches, scattered over the body, especially on the face, forehead, elbows, knees and legs). In the '*ṛṣya-jihva*' leprosy, it (*the lepra erythematous patch*) has the size and the roughness of antelope's tongue. Black scales appear in '*kapāla*' (*scabby leprosy : psoriasis*). Black-red patches like those of the fruit of '*abrus precatorius*' appear in '*kākaṇaka*' (*lepra nigricans*, black in the centre and reddish at the edges as in the '*kākaṇaka*' fruit). Heat, tensive pain, hyperæmia and cloudy sensation (disturbances of the cutaneous nerves) are felt in these four kinds of leprosy. With microbes bullæ appear, burst and ulcerate.

'*Paunḍarika*' (*nodes*) are shaped like the lotus leaves ; '*dadru*' is copper-colored or like that of the flower of '*linum usitaliosimum*' (dark) and the nodes continue to grow covered with herpes. The nodes of both '*paunḍarika*' and '*dadru*' are elevated, globular and pruritic and they take a long time for their growth. These are their general symptoms.

Minor '*kuṣṭha*' : Hard, broad-based, thick and dry nodules develop at the joints in '*sthūla-rukṣa*' (*dry leprosy*). There is contraction of the skin (the skin thickens by infiltration and forms deep sulci by folding on itself), boring pain and anesthesia in '*mahā-kuṣṭha*' (*anesthetic leprosy*). The disease in which the skin becomes dark-brown (bronzed) is called '*eka-kuṣṭha*' (Addison's disease); this is incurable. In '*chamādala-kuṣṭha*' (*tinea albigena* ?) there are pruritus, tremor, tensive and burning pain in the palms of the hands and soles of the feet. The leprosy in which the skin, blood and the flesh become affected, and spread over the body, like erysipelas (*visarpa*), and which causes swooning, burning sensation, nervousness, pricking pain and ulceration, is called '*visarpa-kuṣṭha*' (cutaneous leprosy). The leprosy in which exudative bullæ repeatedly spread over the body is called '*parisarpa*' (*macular leprosy*). The skin lesion, in which there is pruritic, whitish, painless and scattered (*tanu*=*thin*) eruption in the upper part of the body, is called '*śidhma-kuṣṭha*'. The skin lesion in which very pruritic, painful and dry patches appear over the entire body, is called '*vicharchikā*' ; if this very pruritic and painful manifestation appears only on the

foot, it is called '*vipādikā*' (*psoriasis*). The skin lesion which is exudative, globular, superficial, very pruritic, shiny and dark, is called '*kiṭima*' (*acne keloid*). If exudative, pruritic, inflammatory and tiny pustule appears over the entire body, it is called '*pāmū*' (*eczema*). If the '*pāmā*' becomes suppurative, it is called '*kachchhu*', '*pyosis tropica*'. Pruritic but non-exudative pustules that appear over the entire body, are called '*rakasū*' (dry eczema). *Syśruta* II. 5. 7-10¹⁰¹.

161. तत्र वातेमारुणभानि तनूनि विसर्पौणि तोदमेदस्त्रापयुक्तान्यरुणानि ।
पित्तेन पक्षोदुस्वरफलाकृतिवर्णान्धौकुम्भराणि ; कृच्छ्रजिह्वाप्रकाशखरत्वानि कृच्छ्र-
जिह्वानि ; कृष्णकपालिकाप्रकाशानि कपालकुष्ठानि ; कार्पाशकफाफलसङ्गशान्तौघ-
रक्तकृष्णानि काकशकानि । तेषां चतुर्णामप्योषधोषपरिदाहधमायमानि विप्रोत्थान-
प्रपाकभेदित्वानि क्रिमिजम्ब च सामान्यानि लिङ्गानि ॥ ७

पुष्परीकपत्रप्रकाशानि पीण्डरीकाणि ; अतसीपुष्पवर्णानि ताम्बाणि वा विसर्पौणि
पिङ्गकावनि च दद्रुकुष्ठानि । तयोर्हयोरप्युत्सन्नता परिमण्डलता कण्डूचिरोत्थान-
त्वञ्च त्रि सामान्यरूपाणि ॥ ८

शुद्धकुष्ठान्यत ऊर्ध्वं वक्ष्यामः ॥ ९

स्थूलानि सन्निवृत्तिदारुणानि स्थूलानि स्युः कठिनाण्यङ्घ्रि ।

त्वक्कोषभेदस्त्रपनाङ्गसादाः कुष्ठे महत्पुष्पयुते भवन्ति ॥

कृष्णारुणं येन भवेच्छरीरं तदेककुष्ठं प्रवदन्त्यासाध्यम् ।

स्युर्येन कण्डूव्यथनीषधोषाकलेषु तच्चर्मदलं वदन्ति ॥

विसर्पं वत् सर्पंति सर्वतो यस्ययक्तमासाध्यमिभूय शीघ्रम् ।

सूक्ष्माविदाहारतितोदपाकान् कृत्वा विसर्पः स भवेद्विकारः ॥

“When the microbes begin to eat up the skin etc., various symptoms appear according to the nature of the lesion. Due to ‘*rāta*’, (*lepromas*) become pale-white or sun-colored, rough and dry, and there are boring pain, emaciation, piercing pain, tremor, wrinkles of the skin, horripilation, lassitude, paralysis, anesthesia, gangrene and mutilations (of extremities). Due to ‘*pitta*’ the following symptoms manifest, as burning sensation, sweating, effusion, decomposition (of the tissues), exudation, ulceration and bloody color (of the sores). From ‘*śleṣmā*’ the following symptoms manifest as chilliness, whiteness (of the macular patches), pruritus, hardness (of the nodes), heaviness, elevation (of the nodes, thickening and folding of the skin), fattiness (fatty infiltration) and (ulcerous) crusts.

शमेः शरीरे पीडकाः खल्वन्यः सर्पन्ति यास्तं परिसर्पमाहुः ।

कण्डूनिवर्तं श्वेतमपायि सिधं विद्यात् तनुं प्रायश्च ऊर्ध्वकाये ॥

राज्योऽतिकण्डूर्षिर्द्वजः सुखा भवन्ति गात्रेषु विशर्षिकायाम् ।

कण्डूमती दाहद्वजोपपन्ना विपादिका पादगतयेवमेव ॥

यत् खावि हस्तं घनमुयकण्डू तत् खिग्धक्षणं किटिमं वदन्ति ।

साक्षावकण्डूपरिदाहवन्तिः पामाणकानिः पिङ्गकानिद्वया ॥

स्फोटैः सदाहिरति सेव कण्डूः स्निग्धपाणिपादप्रभवैर्निद्वया ।

कण्डूनिवर्ता या पिङ्गका शरीरे संखावहीना रक्तोन्मथते सा ॥ १०

चरकसंहिता, निदानस्थानम् ५ ।

"When the microbes eat up slowly the four (layers) of the skin (epidermis, corium, muesum and corneum), vessels and nerves (*śirā*), tendons and tender bones, then there are other complicating leprous symptoms as exudation, gangrene, deformations, polydipsia, fever, diarrhoea hyperæmia, debility, anorexia and indigestion, in which it becomes incurable". *Charaka* II. 5. 15-16¹⁶².

Leprosy is caused by Hansen's '*bacillus lepræ*' which morphologically has a very striking resemblance to the tubercular bacillus, but according to Jamanito, the tubercular bacillus is stained black by the silver nitrate method, while the '*bacillus lepræ*' remain transparent. However, a large percentage of the lepers are found either tubercular or syphilitic. And these three diseases are very alike in their evolution and it is very hard often to diagnose one from the other without differential diagnosis. The '*lepra bacilli*' are found in all diseased tissues, in nasal, salivary, vaginal and urethral secretions, tears,

162. क्रिमयस्तु लघादौश्चतुरः सिरास्त्राय चास्थान्यपि च तद्वर्णानि ख्यादन्ति ।
अस्त्राश्चैवावस्थायां कुष्ठिनमुपद्रवाः स्पृशन्ति । तद्यथा प्रस्रवणमङ्गभेदः पतनान्वह्ना-
क्यवानां दन्ताज्वरातिसारदाह-दीर्घज्वारोचकाविपाकाश्च तथाविधमसाध्यं विद्यादिति ।

चरकसंहिता, निदानस्थानम्, ५ ।

sputum, semen, macular scales, exudation or discharges from the sores. It seems that the lepra bacillus takes a long period for the evolution of leprosy and incubation is very slow lasting from 2 to 20 years. The lepra bacillus is infectious, but its contagion is not of a virulent type, as is demonstrated by the fact that usually the attendants at the leper asylums with cleanliness of the body, hygienic living and nutritious dietary, escape from this loathsome malady. On the other hand it is undeniable that the segregation of the lepers in Norway, Hawaii and the Philippine Islands have shown a very promising result, in not only arresting the spread of leprosy, but also tending to uproot the disease entirely as it has been done in Europe. However, the mode of its infection is not yet known. It seems the lepra germs find a favorable medium for growth, like tubercular bacilli, in an organism devitalized by malnutrition, uncleanness and unhygienic living. And that perhaps explains how with improved living and hygiene, it has practically died out of Europe. It is usually found in the East among the poorer classes who suffer from chronic malnutrition and live in unhygienic surroundings in the midst of filth and misery. The tissues therefore lack the resisting power against

the invasion of the '*lepra bacilli*' though they possess but feeble virulence.

There are three forms of leprosy : (I) '*tubercular leprosy*, (2) '*muculo-anesthetic leprosy* and (3) '*mixed leprosy*. In the tubercular form, there are repeated attacks of fever as a reaction of the organism against the invasion of the lepra bacilli. There may be pruritus and hyperesthesia of the skin with neuralgic pain in all locations. In most cases there is a premonitory eruption of vesicles or bullæ, affecting the extremities chiefly. These bullæ appear rapidly, are usually painless, break spontaneously, and often heal as ulcers, leaving behind a pigmented spot, brown, black, or white. Spots gradually make thus their appearance in various parts of the body, and the macular eruption is more frequent as the disease progresses. This may continue for months or years according to the resisting power of the organism. The small tubercles appear, grow in size and become confluent. They may simply ulcerate, without marked destruction of tissue, leaving small superficial ulcers, covered with greenish or brown crusts, destroying by degrees the adjacent tissues, tendons, ligaments, and finally the bones. If treated, they cicatrize and produce deformities; but if

neglected, they suppurate, and cause amyloidosis or gangrene. Almost from the beginning the senses are disturbed.

In the maculo-anesthetic or tropho-neurotic form of leprosy, the infiltration principally takes place into the nerves, causing their gradual irritation, inflammation, degeneration and destruction. In the first inflammatory stage, there is hyperesthesia, sensory, vaso-motor and motor disturbances manifested by burning numbness, formication (*sensory*), flushings of the face, glossy skin (*vaso-motor*), twitchings of the muscles (motor) particularly of the face, paroxysms of neuralgic pain and cutaneous manifestation. This is gradually succeeded by a period of nerve degeneration, marked clinically by anesthesia, paralysis, atrophies and distinct trophic disturbances. With the anesthesia, there appears a muscle-atrophy which first of all attacks the muscles of the hand (causing contraction), the extensors and flexors of the forearm, causing the characteristic '*claw-hand*'. There is loss of power, sense of touch, of heat and cold, even of pain. The muscles of the feet are likewise affected. There is a variety of trophic disturbances at this stage --shedding of the nails, loss of pigment, loss of

hair, loss of teeth, ulceration, followed by dry gangrene, necrosis and absorption of the bone with the resultant mutilation.

The '*mixed*' is really the typical form of leprosy, combining the tubercular and tropho-neurotic manifestations, and the symptoms of both types are present. Of course lepra bacillus is found in all cases in all leprous lesions, whether located in the skin, mucous membranes, nerves or internal organs. Malnutrition, uncleanness, infections of tuberculosis or syphilis which are found among a large percentage of the lepers, not only predispose the organism to leprosy, but also accelerate the progress of this malignant disease and hasten death.

Treatment :—'For a pious leper who wishes to live and for whom the five methods of treatment have not been effective, the wise physician should treat him in the following manner :—Ripe fruits should be collected, in the rainy season of the '*tubara*' (*Faractogenos Kurzii*: *chaulmugra*) tree which grows on the southern sea-coast (*Arakan*) and whose branches are agitated by the wind, raised by the ocean waves ; the kernel of the fruits is to be taken out, dried and made into fragments. And then they should be pressed in a mill like

the sesame-oil press, or the oil extracted in a basin as with the saffron flower (*crocus sativus*). This should be put on fire (in a kettle) and when all the water has been evaporated from the oil, it ought to be taken out and placed (in a flask) in dried cow-dung for a fortnight. When the patient has been fattened by the treatment of oils, sweated by diaphoretics, cleansed (internally) by purgatives and emetics, then in a lunar auspicious evening, he should drink the oil, consecrated with the hymn that the essence of the kernel is the antidote of all poisons, etc. The 'tubara' (*chaulmugra*) oil causes repeated evacuations of the toxin (of the leprous lesion) through the upper and lower channels (*chaulmugra* oil is very irritant, and causes vomiting and purgation. It should be given in a capsule, or better still, to be effective, ethyl ester preparations of the fatty acids of the '*chaulmugra* oil' can be administered intramuscularly with the hypodermic syringe with marvellous results). After this cold barley water should be drunk without any salt (which provokes vomiting) and fat (which stimulates peristalsis). Thus he shall drink for five days the oil, and for a fortnight giving up all injurious habits as anger etc., shall live on rice and

the broth of 'mudga' (phaseolus mungo, both of them are constipative). If thus for five days the patient drinks the oil, he gets cured of all kinds of leprosy. If this 'tubara' oil is cooked together as before with three times the quantity of the decoction of *khadira* (*Mimosa ferruginaceæ*) and he untiringly drinks it for a month, all leproma become destroyed, with the inunction and imbibition of the oil, together with proper dietary, and hoarseness of voice, red-eyes and ulcers eaten by bacteria are cured soon." *Suśruta* IV. 13. 8-9¹⁶³.

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पञ्चकर्ष्यगुणातीतं शब्दावनं जिज्ञीविषुम् ।
 योगेनानेन मतिमान् साधयेत् कुष्ठिन नरम् ॥
 हृत्वास्तुवरका ये स्युः पथिमाणं बभूमिषु ।
 बीचीतरङ्गविक्षेप-मावतोद्धतपद्मवाः ॥
 तेषां फलानि गृह्णीयात् सुपक्वान्स्वदागमे ।
 मज्ज तेभ्योऽपि स' हृत्य शोषयित्वा विचूर्ण्य च ॥
 तिलवत् पोषयेद्दोषां ज्ञावयेत्वा कुसुम्भवत् ।
 तत्तैलं स' हृतं भूयः पच' दा तोयस' चयात् ॥
 अवतार्य करोषे च पचमाव' निधापयेत् ।
 क्षिण्वः स्निग्धो हृतमनः पचाद्दूर्ध्वं प्रयत्नवान् ।
 चतुर्थभक्तान्तरितः शुक्लादौ दिवसे शुभे ॥ ८
 मन्त्रपूतस्य तैलस्य पिबेन्मात्रां यथाश्लक्ष्म् ।
 तव मन्त्रं प्रवक्ष्यामि येनेदमभिमन्त्रते ॥

"If one eats the kernel of the '*tubara*' fruit, his body becomes cleansed of all impurities ; it is very potent, and is the best medicine for leprosy." *Suśruta* IV. 13. 10¹⁶⁴.

Tubara or *chaulmugra* (*Taraktogenos kurzii*), by which name it is better known, is certainly the best medicine known yet in the treatment of leprosy. A few intramuscular injections of the ethyl esters or intravenous in-

मज्जमार महावीर्यं सर्वान् धातून् विशोधय ।

शङ्खचक्रगदापाणिस्त्रिधाशापयतेऽप्युतः ॥

तेनास्योद्धर्मधन्यापि दोषा यान्यसक्तात् ततः ।

अखेहलवणां सायं यन्मागूं शीतलां पिबेत् ॥

पञ्चाहं प्रपिबेत् तैलमनेन त्रिदिना नरः ।

पक्षं परिहरेच्चापि मुद्गय् बीदनाशनः ।

पञ्चभिर्दिवसैरेवं सर्वकुष्ठैर्विमुच्यते ॥ ८

तदेव खदिरकाथे त्रिगुणे साधु साधितम् ।

निहन्ति पूर्व्ववत् पक्वं पिबेन्मासमुत्तम्वितः ॥

तेनाभ्यक्तयरोरस्य कुर्वीताहारमौरितम् ।

भिन्नस्वरं रक्तनेत्रं विशीर्णं क्रिमिभक्षितम् ॥

अनेनाय प्रयोगेण साधयेत् कुष्ठिनं नरम् ।

सुश्रुतसंहिता, चिकित्सितस्थानम्, १३ ।

164.

शोधयन्ति नरं पीता मज्जानसस्य मावया ।

महावीर्यसुवरकः कुष्ठमीहपहः परः ॥ १०

सुश्रुतसंहिता, चिकित्सितस्थानम्, १३ ।

jection of the salts—chaulmoogric and hydnocarpic acids, result in the destruction of the lepra bacilli in the tissues, followed by the disappearance of the nodules and healing of the ulcers. The oral administration of the chaulmugra oil is not so successful, for the reason that it is nauseating and offensive to the stomach, and when injected intramuscularly, it is extremely painful and very slowly absorbed. Its fatty acids—chaulmoogric acid and hydnocarpic acid, being solids, are unsuited for hypodermic administration. But the ethyl esters of these acids, being thin fluid oils, are well suited for infection and are well absorbed. And they have given remarkable result within a short time. These ethyl ester derivatives have been in use at the United States Public Health Service leprosy investigation station at Kalihi in the Hawaiian Islands only for three years with a very limited supply of the oil, and within this short period 140 lepers have been paroled and returned to their families, the disease apparently arrested, if not totally cured. From the joint report of J. T. McDonald of the leprosy investigation, and A. L. Dean, President of the University of Hawaii, the following conclusion may be summarized: (1) The intramuscular

injection of the ethyl esters of the fatty acids of the chaulmoogra oil usually leads to rapid improvement in the clinical symptoms of leprosy. In many cases the lesions disappear, except for scars and permanent injuries, and the leprosy bacillus can no longer be demonstrated. (2) When combined with iodine, the fatty acids of chaulmoogra oil and their esters give good result, but there is no adequate experimental proof that it causes any increase in the effectiveness of the materials used. (3) Although conclusive evidence is not at hand, it is probable that the oral administration of chaulmoogra oil derivatives is of minor importance compared with the injections. (4) In treating leprosy, it is important to make use of all auxiliary agencies to build up and maintain bodily vigor. (5) It has been sufficiently established that the chaulmoogra oil contains one or more agents which exert a marked therapeutic action in leprosy. We can not as yet say the disease is cured, since we have no test adequate to establish such a verdict. Whether or not the apparent cures are real and permanent, it is evident that we have a valuable agent at our disposal for the control of the disease.

In Burma and Assam, four varieties of

Chaulmugra trees (*Hydnocarpus castana*, *Hydnocarpus anthelmintica* in Siam where it is known as *Maikrabao* tree, *Gynocardia odorata* and *Taraktogenos kurzii*, spoken of by the Burmese as 'kalaw') are seen together, and they can not be easily distinguished one from the other without accurate botanical description. The trees, leaves, fruits and the oils are very similar. Only the genuine chaulmoogra *Taraktogenos kurzii* lacks the double testa on the fruit of the other varieties, and the oil derivatives of the '*Taraktogenos kurzii*' have the potent therapeutic value. Others only possess it to a lesser extent.*

VIII. Diseases of the Genital Organs.

"*Vrddhi (oscheonous)* is the vascular swelling of the sac (scrotum) containing the testes, due to various lesions. Pain in the bladder, groin, testes and the penis are its prodromal symptoms.

The scrotum is distended and rough like a bladder filled with gas, and without any apparent cause there is pain due to the gas, in

* The vivid description of the Chaulmoogra tree is given with illustrations in the March content of the *National Geographic Magazine*, Washington, 1922, by J. F. Rock who was sent by the U. S. A. Department of Agriculture to secure the seeds of Chaulmoogra.

vāta-vrddhi (*emphysema* may be classified under two divisions : (1) benign, where the gas is introduced into the tissues through a local wound or where its source is from some distant wound which communicates with the air-passages or bowels ; and (2) malignant, where gas is generated in connection with bacterial fermentation. The benign form gets well spontaneously. For the malignant form, incision, drainage and thorough disinfection are necessary).

The scrotum has the color of the ripe fruit of '*ficus glomerata*' and it (inflammation) grows and suppurates rapidly, in '*pitta-vrddhi*' (*epididymo-orchitis*) in which the symptoms somewhat differ according to whether the epididymis or the testis is more affected. On the whole the symptoms are more severe with the latter than with the former, though suppuration is more frequent in epididymitis. Premonitory symptoms are fever, headache and general malaise, followed by tenderness and pain in the affected parts. This disease might arise from the extension of the chronic gonorrheal inflammatory process or secondary manifestation of syphilis in interstitial or gummatous forms. The patient must be put to bed and have the scrotum raised and supported with a pillow and ice-bag. The bowels

are to be opened with a purgative to remove internal congestion and light liquid food should be given as milk. After the inflammation has subsided, hot lead-lotion dressings or hot fomentations can be used advantageously to increase the vascularity of the part, thus aiding in the removal and absorption of the inflammatory products. If suppuration takes place, the abscess must be incised, drained off and the abscess cavity disinfected. If the lesion is of syphilitic origin, antisymphilic treatment is very beneficial).

It is tense, slightly painful, cold and pruritic in '*śleṣma-vrddhi*' (edema is common as the scrotum being elastic and distensible, is especially liable to be invaded by general dropsical effusions).

The scrotum encloses a dark tumor and has all the symptoms of epididymo-orchitis in '*rakta-vrddhi*' (*hematocele* which is a tumor caused by collection of blood in the cavity of the tunica vaginalis. It differs from hydrocele in that it is not transparent. It is usually associated with some traumatism, and is accompanied by inflammatory symptoms. Any variety of hydrocele or spermatocele may rapidly refill with blood, after being tapped, thus forming hematocele or by filaria. Hemorrhage also may take place into

the loose tissues about the cord, forming a tumor, sometimes called, diffused hematocele of the cord. For treatment, the sac should be incised antiseptically, the clot removed, the cavity irrigated, and drainage established and continued until such time as the obliteration of the sac by granulations has been accomplished).

It is boggy, glistening, pruritic, slightly painful and looks like the fruit of the palmyra tree (*Borassus flabelliformis*) in '*medo-vrddhi*' (*elephantiasis*, the Scrotum is a favorite seat of this affection. The growth is slow, painless and progressive and may reach the weight of 150 pounds or more, and is caused by the blocking of the afferent lymph ducts by the adult worms and the eggs of *Filaria bancrofti*. The disease is confined to high temperature region and the egg of the *Filaria bancrofti* is introduced into the body by the bite of the mosquito, belonging to different species which are known to be its carrier as *Culex fatigans*, *Mansonia uniformis*, *Mansonia pseudotitillans*, *Pyretophorus costalis*, *Myzomia rossii*, *Myzorhynchus nigerrius*, *Cellia albimana*. The only effective treatment of the disease is operative removal which is very easy and successful, if special attention is paid to antisepsis, so that there can be no

septic absorption from the stump. To keep the skin clean and aseptic, and to choose the parts of the skin as flaps are rather important factors of a successful operation. The pedicle is clamped and the scrotal tissue removed, care being taken to leave the testicles and penis and ligaturing the vessels as they are exposed. The exposed testicles become covered by granulation and cicatrization).

Due to the retention of urine, the scrotum palpitates like a leather-bag filled with water ; it is boggy and in this disease, there are strangury, pain in the testes and edema of the scrotum ; it is called '*mūtra-vrddhi*' [urinary extravasation or *hydrocele*, possibly the latter. Urinary extravasation invades the scrotal tissues, causing a tumefaction as in simple edema (*śleṣma-vrddhi* hydroscœcele). The urine however excites greater irritation than serous effusion, and consequently the scrotal tissues speedily become infiltrated by inflammatory exudates. If it be not relieved with a puncture-needle, trocar or incision, it usually results in abscess formation. Vaginal hydrocele on the other hand, consists of a collection of fluid, more or less serous, in the cavity of the tunica vaginalis. Perhaps by '*śleṣma-vrddhi*' (osche-

dema) hydrocele was meant. But according to the tradition, 'mūtra-vrddhi' is taken for hydrocele. The etiology of vaginal hydrocele is yet obscure. In the tertiary stage of syphilis, there is diffuse gummatous infiltration or the formation of localized gumma in the testes accompanied usually by a small hydrocele. In infancy the hydrocele is generally connected with gastro-intestinal fermentation ; in childhood and early adult life, it is very often associated with some abnormal condition of the testicle or spermatic cord ; later in life it is perhaps concerned with the vascular changes that take place with the degenerative involution of the testes]. "Sūśruta II. 12. 2-5¹⁶⁵.

165. वातपित्तप्रेमशोणितमंदांमूदान्निमित्ताः सप्त वृद्धयः । तासां मूदान्निमित्ते वृद्धौ वातसमुत्थं केवलमुत्पत्तिहेतुरन्यतमः ॥ २

अधःप्रकुपितोऽन्यतमो हि दंष्ट्रः फलकोषवाह्मिण्यभिप्रपद्य धमनोः फलकोषयोर्वृद्धिं जनयति, तां वृद्धिमित्याचक्षते ॥ ३

तासां भविष्यतीनां पूर्वरूपाणि वक्तिकटीमुष्कमेटेषु वेदना मारुतनियहः फलकोषशोफश्चेति ॥ ४

तद्वानिलपरिपूर्णां वांस्तमिवाततां परुषामनिमित्तानिलरुजं वातवृद्धिमाचक्षते । पक्षीकूर्मरसदायां ज्वरदाहोभयतः सायं समुत्थानपाकां पित्तवृद्धिम् । कठिनाल्पवेदनां शोतां कण्डूमतीं श्लेष्मवृद्धिम् । कण्डूस्फोटोदतां पित्तवृद्धिलिङ्गां रक्तवृद्धिम् । सदुद्धिग्धां कण्डूमतमल्पवेदनां तालफलप्रकाशां मेदोवृद्धिम् । मूत्रसन्धारणशीलस्य मूत्रवृद्धिर्भवति, सा गण्डतोऽनुपूर्णा इतिरिव शुभ्रमि मूत्रकण्डूं वेदनां वषणयोः त्रययुं कोषयोश्चापादयति, तां मूत्रवृद्धिं विद्यात् ॥ ५

सुसुतसंहिता, निदानस्थानम्, १२ ।

Treatment : “In ‘*vāta-vṛddhi*’ (*emphysema*) apply soothing salve and emplasterum (*anilā-pahāna* = relief of ‘*vāyu*’ = soothing) ; in case it is of a suppurative type (malignant emphysema), use a pustulant and after it has suppurated, incise (and drain) it without hurting the raphe, and treat it according to the prescribed rules in these cases.

In ‘*pitta-vṛddhi*’ (*epididymo-orchitis*), the treatment of aneurism is beneficial ; if it suppurates, incise it and disinfect it with (antiseptic) ointment (*kṣaudra-sarpi* = honied fat) and then apply vulnerary oil and mucilaginous paste.

In ‘*rakta-vṛddhi*’ (*hematocele*), apply leeches for withdrawal of blood, or give as a sedative (diuretic) honey and sugar ; in suppurative or non suppurative form, hematocele should be attended to.

In ‘*śleṣma-vṛddhi*’ (hydroscœcele or vaginal hydrocele), apply emplasterum of caloric substances as (cow) dung and urine, drink the infusion of *Circuma aromatica* (or *pinus longifolia*) mixed with urine ; except compression, all other treatments of ‘*śleṣma-granthi*’ are beneficial. If it suppurates, incise it, and as a vulnerary of the wound, the restorative oil

concocted with *Tritico estivo*, *Semicarpo anacardia*, *Alangio hexapetalo* and *Echite scholari*, should be applied.

In '*medovrddhi*' (*elephantiasis*), use an emplasterum of a gum-resinous substance as myrrha or any other sedative, warmed with cow's urine to soften the scrotum, and when it is done, it should be bandaged (as antiseptis). Then with encouraging words to the patient, it should be incised with a leaf-shaped instrument, sparing the testes and the raphe, and all the fats removed (*Filaria bancrofti* and the larva which block the lymph-channels and cause the inflammation of the scrotal tissue), then green vitriol (*kāsīśa* = sulphate of iron) and rock salt (as disinfectant) should be applied and the wound sutured properly. As vulnerary, oil cooked with arsenic disulphide, arsenic sulphide, sodium chloride and semicarpus anacarda is to be applied.

In '*mūtrā-vṛddhi*' (*urinary extravasation or vaginal hydrocele*), fomentation should be applied to the scrotum (to make it tense) and then have it bandaged (as antiseptis). By the raphe downward, an instrument like the sharp point of a grain (trocar) should be introduced, and thereby a double-barrelled cannula.

(through the one cannula air is passed to cause pressure so that through the other the fluid content may be completely drained off), the urine (fluid) is evacuated. Then the cannula is to be withdrawn and ligature applied. If the wound remains clean (non-suppurated or granulated), the vulnerary is to be applied. (The only difference in the modern method of tapping in hydrocele, is that after the fluid is evacuated, the cannula is not withdrawn usually, but a syringe which fits it, is filled with half a drachm of a solution of ten parts of carbolic acid to one of glycerine, and is injected into the cavity. This causes but slight pain. However the sac refills partially due to the inflammatory reaction caused by the carbolic acid, but the inflammatory exudate is gradually reabsorbed after the inflammatory process giving rise to it has subsided. However, tapping is but a palliative measure. It has to be done once or twice a year. But perhaps because it causes so little inconvenience and discomfort, it is preferred to operation by excision of a portion of the sac especially in old hydroceles with thickened walls due to sclerous and calcerous changes in the subserous tissues, which gives a more satisfactory result. However, whether in tapping or in operation, care has to

be taken to avoid wounding the testes or scrotal vessels). *Subrta* IV. 19. 3-8¹⁰⁰.

166. खेडापनाङ्गी कुर्याच्च प्रदीक्षांशानिलापङ्गान् ॥
 विदग्धा पाचयित्वा वा सेवनीं परिवर्जयेत् ।
 भिन्नात् ततः प्रभिन्नायां यथोक्तं क्लृप्ताचरेत् ॥ ७
 पित्तजायामपक्वायां पित्तयन्धिक्रमो हितः ।
 पक्षा वा भेदयेद्भिन्नां शोधयेद् चोद्वसर्पिषा ।
 शुद्धायाश्च भिषग्दद्यात् तैलं कल्कश्च रोपणम् ॥ ४
 रक्ताजायां जलीकामिः शोणितं निर्हरेद्भिषक् ।
 पिवेद्विरेचनं वापि शर्कराचोद्वसंयुतम् ।
 पित्तयन्धिक्रमं कुर्यादानीं पक्वे च सर्व्वदा ॥ ५
 वृद्धिं कफात्मिकाम् शुष्मं तपिष्टं प्रक्षेपयेत् ।
 पीतदाहकषायश्च पिवेन्मूत्रेषु संयुतम् ॥
 विष्कापनाङ्गि वापि वैष्णव्यक्रमो हितः ॥
 पक्षायाश्च विभिन्नायां तैलं शोधनमिष्यते ।
 सुमनस्कृष्टाङ्गोऽसप्तपर्णेषु साधितम् ॥ ६
 भेदःसमुत्थां संश्लेष्य लेपयेत् सुरसादिना ।
 शिरोविरेकद्रव्यैर्वा सुखोष्णैर्भूतसंयुतैः ॥
 स्निग्धाश्चावेष्ट्य पट्टेन समान्वास्य तु मानवम् ।
 रक्षेत् फले सेवनीश्च वृद्धिपट्टेण दारयेत् ॥
 भेदस्ततः समुत्तुल्य दद्यात् कासोससंश्लेषे ।
 बध्नीयाश्च यथोद्दिष्टं शुद्धे तैलश्च दापयेत् ॥
 मनःशिलाश्लेषः सिद्धमाह्वारेषु च ॥ ७
 सूज्वां स्नेहयित्वा तु वस्त्रपट्टेन वेष्टयेत् ।
 सेवन्वाः मार्ज्जतोऽधस्तादिष्वेद्विहीतुं श्रेष्ठं च ॥

"Carriage of a heavy burden, wrestling with a strong man, fall from a tree—all these strains increase 'vāyu' which enlarges the viscera and which in its downward course makes a tumor-like formation in the groin (*inguinal hernia*). If it be not attended to, it descends to the scrotum (*osceocele*) and causes the inflammation of the testes. This causes the distension of the scrotum like that of the bladder, and if it be pressed, gas ascends with noise, but descends again when left. This is called '*antra-vrddhi*' (*inguinal hernia*). It is an incurable disease. "*Suśruta* II, 12. 6¹⁶⁷.

"The hernia that has reached the groin, to

अथान् विमुखां नाडीं दत्त्वा विस्त्रावयेद् भिषक् ।

मूर्ध्ना नाडीमधीकृत्य स्थगिकावन्धनाचरेत् ॥

शुद्धायां रोपणं दद्यात्तर्ज्ज्वेदमश्नुतुकीम् ॥ ८

सुसुतसंहिता, चिकित्सितस्थानम्, २१ ।

167. भारहरणवत्प्रविवह-वत्प्रपतनदिभिरायासविशेषैर्वायुरतिप्रवृद्धः प्रकुपितश्च स्त्रूलान्मुखे तरलश्चैकदेशं विगुणमादायाधो गत्वा बद्ध्वासन्धिरुपेत्य शनिक्रमैश्च स्थित्वा प्रतिक्षिप्तमाथि च कालान्तरेण कलकोशं प्रविश्य मुष्णस्तीक्ष्णपादवल्गाघाते वक्षिरिवाततः प्रदीर्घः शोफी भवति स्रग्भ्रमवपीडितयोर्हन्मुपैति, विन्त्यश्च पुनराधमति, तान्महश्चिन्मन्त्राध्यामिन्मन्त्रयति ॥ ६

सुसुतसंहिता, निदानस्थानम्, १२ ।

obstruct its passage, should be cauterized by a semilunar-shaped cauter. *Suśruta* IV. 19. 10¹⁶⁸.

Hernia is the protrusion of the abdominal viscera through weak spots in the abdominal wall, which develop either due to congenital deficiency of muscular or tendonous development or due to their degenerative changes. It is met with in two extremes of life. In infancy when the inguinal rings are as yet imperfectly formed, uncontrolled crying, coughing or any other form of severe strain may subject the tissues to give way. In old age tissues begin to degenerate, while the weight of the viscera is heavier, and under severe straining as in asthmatic paroxysm, the weak spots in the parietes are easily apt to yield.

"If the prepuce has been forcibly drawn back (over the glans, and its return is prevented by the arrest of the narrow opening behind the corona), during coitus with narrow vagina, masturbation, accident, play or detumescence, it is called '*avapātikā*' (*paraphimosis*; if this condition is left unrelieved, the circulation in the parts beyond may be interfered with sufficiently to

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तत्र या वक्ष्यन्ता तां हृदिर्होन्मूयन्त्या ।

सन्मन्त्रार्णवतोषार्थं कोषप्रामाण्यं वर्णयेत् ।

सुसुतसंहिता, चिकित्सितसंग्रह, २१ ।

make them swell, as to render retraction very difficult even when the preputial orifice is not very tight).

In '*niruddha-prakaśa*' (*phimosis*) the prepuce adheres to the glans penis, and therefore also contracts the meatus. But if it be not complete, the urine flows drop by drop with pain, ballooning the prepuce but without rupturing the glans penis. (The best remedy of phimosis is circumcision with lateral incision as the dilatation of the preputial opening by any method is only a half measure, involving as much pain as cutting or operating. Phimosis should be corrected as early as possible, as the abdominal pressure exerted in the straining to evacuate the urine and in the crying which often accompanies the effort in such children, is sufficient to prevent the firm closure of the natural hernial openings and to cause yielding of those which have already closed. Another consequence of the mechanical obstruction is the obstacle which it offers to cleanliness, resulting in a balano-posthitis induced by the retention of the smegma which consists of the secretion of the glands of the lining membrane of the prepuce together with the dead epithelial cells from those surfaces, the decomposition of which is hastened by the

admixture of urine. This inflammation reacts on the nervous system and causes its irritability which is expressed in the peevishness of the child, and urinary disturbances such as frequent micturition, involuntary micturition especially at night, and spasmodic and painful micturition. The acrid and irritable decomposition product also provokes priapism in children and for the relief of this they learn and gradually habituate themselves to the pernicious practice of masturbation. In the adult the sexual erethism causes self-abuse, venery, spermatorrhea, premature ejaculation, backache and their various reactions. Circumcision is a great hygienic measure, especially in a tropical country). *Suśruta* II. 13. 40-41¹⁶⁹.

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अल्पयःखां यदा हर्षाहालां गच्छेत् स्त्रियं नरः ।

हस्ताभिघातादथ वा चर्मप्लुवतिंति बलात् ॥

मर्द्दनात् पोडनाद्यापि शुक्रवेगविघाततः ।

यस्यावपाच्यते चर्मं तां विद्यादवपाटिकाम् ॥ ४०

त्रातोपस्तम्बेन चर्मं संश्रयते मणिम् ।

मणियर्धोपमस्तु सूक्ष्मोती कुरुष्व च ॥

निवृत्तप्रकाशे तस्मिन् मन्दधारमवेदनम् ।

सूयं प्रवर्तते जलोर्मणिर्न च विद्योयति ॥

निवृत्तप्रकाशं विद्यात् सवजं वातसम्पन्नम् ॥ ४१

सुसुप्तसंविता, विज्ञानसामान्य, १२१

"Application of '*sūka*' for the enlargement of the penis, causes eighteen kinds of diseases. *Suśruta* II. 14. 2¹⁷⁰.

Traditionally '*sūka*' is taken as a pruritic water insect and used externally as an aphrodisiac. As '*sūka*' is used in the plural, it is possible that it includes some species of the insects, belonging to the 'Coleoptera' order as '*Lytta* or '*Cantharus corulea*' (blue blistering fly of Bengal) or '*Lytta nepalensis*' (Nepal blistering fly, a black species having filiform antennæ and elytra broadened toward the apex), having its active irritating principle '*cantharidin*' and which is used as an aphrodisiac. When dried powder or its active principle is applied to the skin, it causes burning sensation and hyperemia, to which in the course of a few hours, succeeds the formation of vesicles. If the application is continued, it forms a blister, and if it goes on like that for a long time, sloughing and ulcerating result. If it is applied to the penis, it causes a voluminous swelling and engorgement of corpus cavernosum, and violent erection.

170. लिङ्गवृद्धिनिष्ठतामक्रानप्रवृत्तानां यकदीपनिमित्ता दश चाटी च व्याधयो जायन्ते ।

सुसुतसंहिता, निदानस्थानम्, १७ :

“Due to the undue application of ‘*sūka*’, vesicles develop like the mustard seed, and are called ‘*sarṣāpikā*’ (*cantharidal vesicles*).

Due to the application of poisonous ‘*sūka*’, a stone-hard unsymmetrical tumor develops which is called ‘*aṣṭhīlikā*’, *osteoma or chondroma* of the penis : ossification and calcification of the penis have been reported in many cases. The parts involved are the sheaths of the corpora cavernosa and the septum pectiniform. Ossification which is partial takes place usually in the plates very insiduously and without pain, and the patient first becomes aware of its existence by the impediment it offers to coitus or the curvature which it causes to the organ. Tuffier reports a case in which he found a bean-sized chondroma growing on the external surface of one of the corpora cavernosa, near the middle of the organ and which he removed by operation).

If the penis is repeatedly engorged by the ‘*sūka*’, the vesicles that are developed like neoplasm, are called ‘*grathita*’ (*soft vegetations* of succulent warts of the mucous membranes and muco-cutaneous junctions, especially found in the coronal sulcus and near frenum).

Darkish vegetation that develops like the seed of ‘*Eugene jambu*’ is called ‘*kumbhikā*

(*corneous vegetations*, consisting of brown or dirty-brown, sessile, rounded growths, quite firm in structure, growing in the penis, scrotum, crural fields and anus in the male, on the labia majora, perineum and anus in woman).

Ophthalmia (*alajī*) is similar to that of gonorrhea (*prameha*; it is probable that by *alajī* is here either meant the gonorrheal conjunctivitis of the eye, or syphilitic gumma of the conjunctiva or sclera or parenchymatous keratitis).

If through derangement of '*vāyu*', the penis is pressed and beaten (lacking the power of erection and is pendulous) and on it appears vesicles with edema, it is called '*mṛdita*' (*syphilitic edema of the penis*).

The vesicles that develop, in masturbation, are called *sammūḍha* (*herpes progeneralis* which is very pruritic appears about the glans and the foreskin, accompanied with a little moisture. When the parts are inspected in the early stages, small pin-head vesicles will be seen at the edge of the foreskin, in the neighborhood of the corona or near the meatus. When the vesicles have broken, they leave superficial erosions surrounded by minute circular or crescentic areola).

Numerous elongated growths appear, breaking.

in the middle, causing pain, and horripilation, and are called '*avamantha*' (*horns of penis*, which are usually dark-brown or green in color, in texture resembling the nails, but rough on the surface, arising from the coronal sulcus, especially near the frenum, and may attain a length of three inches. They possibly are papillomatous growths, and when protected from the air, remain moist, soft and pinkish, and when exposed become dry, hard and dark-brownish in color. On removal, usually a wart is found at their bases, and they are found in persons of careless habits and advanced life).

Due to the (corruption of) '*blood and pitta*' the sore that develops in the shape of the petal of lotus, surrounded by pustules, is called '*puṣkarikā*' (*chancroid* : it is very hard sometimes to distinguish from syphilitic initial lesion-chancere and the pyogenic ulcer-chancroid. Chancroid is contagious, its secretions being always auto-inoculable, but it is essentially a local lesion, in contradistinction to chancere which is an expression of syphilitic constitutional affection. Chancroid is due to Ducrey's streptobacillus and does not usually appear single, is not sharply circumscribed and is not indurated like the syphilitic sore. The ulcer is surrounded by minute pustules.

on the rugged edge, which is slightly inflamed, and from which if pressed, appears a thin brownish pus, for the streptobacillus is pyogenic, while the spirochete pallida is not. Differential diagnosis is very important before treatment is given, for if the chancroid is treated with mercury or iodoform ointment, it may seriously complicate the case, while with thorough cleansing and antisepsis, it can be easily cured).

If due to the lesion of 'sūka', the (corrupt) blood causes anesthesia, it is called '*sparśa hāni*' (*syphilitic anesthesia* of the penis and impotence).

Due to the indigestion, caused by 'sūka' (taken internally as an aphrodisiac), '*the blood and pitta*' become deranged, and the growths that appear thereby like *Phaseolus mungo* and *Phaseolus radiatum* are called '*uttamā*' (milia, resembling millet seeds, usually benign growths, are not infrequently found in the cutaneous investment of the penis).

If due to the (corruption of) '*vāyu and blood*', the penis is covered with perforating tissues like a sieve, it is called '*śata-ponaku*' (*tuberculosis of penis* occurs in two forms. The majority of cases are examples of chronic tuberculous ulceration of the skin or the mucous membrane, the ulcers having the same irregular worm-eaten

shape, blue undermined edges and slowly sloughing or granulating cases. The other form which is rarer, appears to begin in the depth of the erectile tissue, producing a necrotic mass, closely resembling the tuberculous sequestra seen in a spongy bone. The latter form is perhaps indicated by '*śata-ponaka*').

"If due to '*pitta and blood*', the skin of the penis ulcerates, with burning and fever, it is called '*tvak-pāka*' (*erysipelas* or *cantharidal ulceration*, due to its excessive and concentrated application).

The dark, blood-tumor covered with very pruritic vesicles, is called '*sonitārṇvuda*' (*angioma* : though angina is more frequent than other benign tumors, it does not attack the penis so commonly as the female organs of generation. Angioma is generally seen in children, forming a superficial flat tumor, giving rarely any symptoms, unless a considerable part of the organ is involved and in that case troublesome priapism has been observed.

Due to the lesion of the tissues, develops a neoplasm, called '*māṃsārṇvuda*' (*epithelioma* or *cancer of the penis* : cancer almost invariably originates on the prepuce, glans or both combined and is a disease of advanced life. The most

common mode of origin of epithelioma of the penis is in warty growths, which may promptly or after the lapse of months or years, degenerate into a malignant type. The etiology of the disease is obscure. Beside the unknown factor—tissue susceptibility, chronic irritation caused by phimosis, balanitis, venereal ulcer, especially a chronic ulcer of syphilitic origin seems to be the chief cause of cancer of the penis. It may be grafted from the cancer of the uterus where it is commoner than in man, during coitus. If the diagnosis is correct, amputation or extirpation according to the severity of the lesion, is the only safe remedy. For in many cases, destruction of tissue is marked as well as growth, and the malignant growth consists of an ulcer which may be very deep in the center with greatly thickened and indurated borders, the induration preceding the spread of the ulcer on all sides, and often the urethra is perforated so that the urine can only pass through the soft sloughing tissues, thus producing extensive ulceration).

When ulceration takes place (of the epithelioma), it is called malignant '*māṃsa-pāka*' (ulceration of the cancer).

All the symptoms of complicated tumor,

mentioned before (*Suśruta* II. 9) are the same in the case of the 'vidradhi' (*sarcoma* of the penis, like the sarcoma of the other parts of the body, may be found at any time of life from childhood to old age, and is chiefly found in the tissues of the corpora cavernosa, running a rapid and insidious course, forming a tumor without any painful sensation, but enlarging and distorting the penis. If the tumor is extirpated, there is always great danger of the return of the morbid process).

If the poisonous black or multicolored 'śūka' is used, then the tissues ulcerate with dark pigmentation and fall off ; this disease originates from the (corruption) of the three humors and is called 'tila-kalaka' (*gangrene* : Gangrene of the penis is observed in young, but more commonly in elderly, subjects. In some cases balanitis, phimosis, paraphimosis, chancre, or chancroid has been the starting point. Cases have been reported in which gangrene of the penis was said to be due to ingestion of ergot and cantharides). *

(Of these diseases), *epithelioma* (*māṃsārṇvuda*), *ulceration of the cancer* (*māṃsa-pāka*), *sarcoma*

* R. W. Taylor : *Genito-urinary and Venereal Diseases*, p. 270.

(*vidradhi*) and *gangrene* (*tilakālaka*) of the penis are incurable." *Suśruta* II. 14. 3-32¹⁷¹.

"Masturbation, manipulation or traumatism of the penis causes the derangement of the 'vāyu', which corrupts the (mucous membrane of) prepuce and causes intumescence, of the glans ; it is called '*pari-vartikā*' (*balanitis*) and being of 'vāyu' and infectious origin, it is

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गोरसर्पपतुष्या तु यकदूर्भग्रहेतुका ।

पिङ्का कफरक्ताभ्यां ज्ञेया सर्पपिका दुधैः ॥ ७

कठिना विषमै रक्तैर्भासतस्य प्रकोपतः ।

यकैस्तु विषसंयुक्तेः पिङ्काछीलिका भवेत् ॥ ४

यकैर्यत् पूरितं शब्दयचितं तत् कफोत्थितम् ॥ ५

कुम्भिका रक्तपित्तोत्था जाम्बवास्थिनिभा शुभा ॥ ६

अलज्जिलक्षणे युक्तानलजीव दितर्कयेत् ॥ ७

मदितं पीडितं यत् तु संरम्भं वायुकोपतः ॥ ८

पाणिभ्यां भृशसंमूढे संमूढपिङ्का भवेत् ॥ ९

दीर्घा वल्ल्याश्च पीङ्का दीर्घान्ते मध्यतस्तु याः ।

सोऽवमग्नयः कफासृग्भ्यां वेदनारोमदुर्षं कृत ॥ १०

पित्तशोणितसम्भूता पीङ्का पिङ्काचिता ।

पद्मपुष्करसंस्थाना ज्ञेया पुष्करिकेति सा ॥ ११

जनयेत् स्पर्शहानिस्तु शोणितं यकदूर्भितम् ॥ १२

सुद्रुमावोपमा रक्ता पीङ्का रक्तपित्तजा ।

उत्तमे वा तु विज्ञेया यकाजीर्णं निमित्तजा ॥ १३

क्षिद्रैरण्मुखैर्यत् तु चितं मेढं समन्ततः ।

वातशोणितजी व्याधिर्विज्ञेयः शतपोनकः ॥ १४

painful, causes burning and occasionally suppurates. If it originates from 'śleṣmā', it is hard and pruritic (papilloma or any other vegetation." *Suśruta* II. 13. 39¹⁷².

पित्तरक्तकृतो ज्ञेयस्त्वक्पाको ज्वरदाहवान् ॥ १५

कृष्णस्त्रीटेः सरक्तानिः पिङ्गवाभिश्च पीडितम् ।

यस्य वक्षिकजखोया ज्ञेयं तच्छोषितार्धुदम् ॥ १६

मांसदोषेण जानीयादर्धुदं मांससम्भवम् ॥ १७

शीर्यन्ते यस्य मांसानि यस्य सर्वाश्च वेदनाः ।

विद्यात् तं मांसपाकान्मु सर्व्वदोषकृतं भिषक् ॥ १८

विद्रधिं सन्निपातेन यथोक्तमभिनिर्द्दिशेत् ॥ १९

कृष्णाणि विद्राव्याण्यवा शूकानि सन्निपाधि च ।

पातितानि पचन्याथ मेढ्रं निरवशेषतः ॥ २०

कालानि भूत्वा मांसानि शीर्यन्ते यस्य देहिनः ॥

सन्निपातसमुत्थानं तं विद्यात् तिलकालकम् ॥ २१

तत्र मांसार्धुदं यच्च मांसपाकश्च यः क्षुतः ।

विद्रधिश्च न सिध्यन्ति ये च श्युक्षिलकालकाः ॥ २२

सुक्षुप्तसंज्ञिता, निदानस्थानम्, १४ :

172. महं नात् पीङ्गवाद्यापि तथैवात्यभिघाततः ।

मेढ्रं चर्म्मं यदा वायुर्भजते सर्व्वतश्चरः ॥

तदा वातोपसृष्टन्मु चर्म्मं प्रतिनिवर्षति ।

मणेरधस्तात् क्रीशश्च यग्न्यहपेण लण्यते ॥

सवेदनः रुदाहश्च पाकाश्च व्रजति कश्चित् ।

माहृतान्मुसम्भूतां विद्यात् तां परिवर्त्तिकाम् ॥

सकण्ठः कठिना चैव सैव श्लेष्मसमुत्थिता ॥ ३९

सुक्षुप्तसंज्ञिता, निदानस्थानम्, १३ :

Balanitis is the inflammation of the mucous membrane of the glans, or of the prepuce (posthitis), or to both conditions combined. The two surfaces are generally attacked simultaneously, except in chronic processes which are limited to small areas. The predisposing cause to inflammation of these parts is the difficulty or impossibility of cleansing them, especially when the foreskin is long and narrow. The active cause may be the retained pus or irritating substances of gonorrhea, chancroid, secretions of primary or secondary syphilitic lesions, or the decomposition of the accumulated smegma mixed with urine and perhaps leucorrheal discharge added to it in coitus. The existence of vegetations under the prepuce provokes balanitis especially when the lodgment of the gonorrheal pus excites the inflammation. Balanitis may occur also in diabetic patients, on account of the ready decomposition of their sugar-laden urine, and a certain fungus, for it is found in the smegma under the prepuce. The treatment of balanitis consists chiefly in the establishment of cleanliness, and if the prepuce can be retracted, this will usually suffice to cure. Parts may be washed with warm water of mild boric acid solution, but strong antiseptics are not desirable

as before they can exert their germicidal effect, they are apt to provoke further irritation of already inflamed surfaces and cause the necrosis of the delicate cells, thus postponing their recuperative power.

“Excess in coitus (*simple urethritis* may be provoked, especially in gouty diathesis), continence (*herpes progentitalis* and reflex nervous irritability), coitus with a nun or one who has had no sexual intercourse for a long time (*urethritis* if the vagina is not kept clean), with a menstruating woman (menstrual blood has been regarded as an etiological factor of *urethritis* from remote antiquity in diverse lands. The menstrual fluid, unless decomposed or mixed with the products of bacterial evolution of one kind or another, whether the germs be autogenetic or heterogenetic, is inconsequential—can not possibly produce *urethritis*. Apparent contradictions are due to the autogenesis of *urethritis* in a previously damaged urethra, or to the washing down of the products of an old infection from the upper portion of the female sexual tract by the out-flowing menstrual secretion) or coitus with a woman whose vulva is long-haired, coarse-haired, thick-haired or there is hair in the vulvar orifice (abrasions, excoria-

tions, fissure or fine cuts made by sharp edges of the hair at certain angles by the copulative paroxysmal movements when the genital organs are in intumescent state, are the necessary and favorable conditions for the venereal germs when deposited there, to grow and multiply. Chancroidal, syphilitic or gonorrheal germs can not cause a lesion unless they can find a lodgment and form a colony, otherwise they will be washed away by the mucous and the urinal discharges. It is only when there is an abrasion, cut, wound, tear, rent or solution of any kind of the mucous membrane, that they can find an entrance, and in the delicate epithelium, with its warmth and moisture, they find it very favorable to multiply to destroy the cells, and invade the economy in syphilis), with a woman of narrow or large vulvar orifice (strain and injuries may be caused by narrow orifice and a flabby large vaginal passage is indicative of some disease or the reaction of the diseased condition of the genitals, as otherwise in the normal state there should be vaginal muscular contraction by the sexual stimuli and the passage of the penis), with an unpleasant or repulsive woman (venereal diseases, especially syphilis causes many disfigurements of the body), with a woman who makes lavation

of her vagina with contaminated water, or one who does not make any lavation of her vagina at all, or a woman who has a genital disease, or who has a chronic lesion in her genitals, or unnatural intercourse (sodomy does not necessarily cause any lesion unless there is an infection in either party, or venery ; excess might cause enervation and its reflex reactions on the organism, thus predisposing to any infection), injury to the penis by nails, teeth, toxic cantharides, compression, masturbation or bestiality (no infection can take place unless there is contact with some venereal pathogenic virus, except it might cause local injuries and pyogenic infection), ablution of the penis with contaminated water, or its strangulation, or retention of urine or semen, or non-lavation (uncleansing) of the penis after coitus—all these causes produce the derangement of the 'vāyu', and provoke the inflammation of the penis, whether it has been wounded or not; this is called 'upadamśa'

There are five kinds of 'upadamśa', each infection originating from five different kinds of contagions of women.

Scaliness (roughness), ulceration of the skin, torpor of the penis and inflammation with induration takes place in 'vāta-upadamśa' (syphilitic

chancre : The initial lesion is first seen as a papule, varying in size from a pea to a bean, pinkish-brown in color, dry and scaling, imparting a slight resistance to the touch, which appears after an incubation of two to four weeks in syphilis, three to seven days in chancroid (which is of diagnostic value in distinguishing chancre from chancroid) after suspicious coitus or contact, and which slowly ulcerates with slightly inflamed and indurated, circumscribed or oval edges, leaving a superficial or eroded depression, having a thin serous or sero-purulent secretion, or it may be covered with a thin grayish pellicle).

Fever (as a reaction of the organism against the invasion of syphilitic '*Spirocheta pallida*') and intumescence like the color of '*Ficus glomerata*' (which is pinkish-brown, the color of chancre) develop, and which rapidly ulcerates with '*pitta*' pain in '*pitta-upadamśa*' (ulcerating chancre).

Intumescence is pruritic, hard and shiny with slight (*śleṣma*) pain, in *śleṣma-upadamśa* (chancre in the first stage):

A dark tumor which bleeds excessively with fever, burning, and emaciation with all '*pitta*' symptoms, and which sometimes (spontaneously)

cures, is called '*rakta upadamśa*' (angioma of the penis on a large artery).

The intumescence ulcerates with the development of germs, which might bring about death, with all the symptoms of the corruption of the three humors in '*sarvva-upadamśa*' (syphilitic sore)." *Suśruta* II. 12, 7-13 ¹⁷³

"The contagion (syphilitic '*Spirocheta pallida*') infecting the tissues and the blood, causes their

173. तमातिमैद्युनादतिब्रह्मघर्ष्यां तथा ब्रह्मचारिणो चिरोत्सृष्टां रजस्वलां दीर्घरोमां कर्कशरोमां सङ्कोशरोमां निगूढरोमान्मन्त्राणां महाहारामप्रियात्मकामा-
मचौचासलिलप्रचलितयोगिमचालितयोगिं योगिरोगोपसृष्टां स्वभावतो वा दुष्टयोगिं
पियोनिं वा नारोमत्यर्थमपसिवमानस्य तथा करजदग्गनविषयकनिपातनादह्नाद-
ह्नाभिघाताश्चतुष्पदोगमनादचौचा - सलिलप्रचालनादपदोङ्गनाश्चतुष्पदविचारवाग्म्यु-
नाग्ने वाप्रचालनादिभिर्मोढभागस्य प्रकुपिता दोषाः चतेऽचते वा न्ययमुपजनयन्ति
तमुपदंशमित्याचचते ॥ ७

स पञ्चविधस्त्रिभिर्दोषैः प्रयुक् समसौरसृजा चैकः ॥ ८

तत् वातिके पादेष्वं रक्त्परिपुटनं सत्वमीदृता पदेष्वोफता विविधाश्च
वातवेदनाः ॥ ९

पैत्तिके ज्वरः शययुः पङ्कोक्तुन्वरसङ्काशस्तीव्रदाहः क्षिप्रपाकः पित्तवेदनाश्च ॥ १०

त्रैभिर्दोषैः शययुः कश्चूमान् कठिनः क्षिब्धः श्लेष्मवेदनाश्च ॥ ११

रक्तजे कृष्णकोटमादुर्भाषोऽत्यर्थमसृक्प्रवृत्तिः पित्तलिङ्गान्वत्यर्थे ज्वरदाहो शोषश्च
वाय्वश्चैव कदाचित् ॥ १२

सर्व्वजं सर्व्वलिङ्गदर्शनमवदरश्च श्लेष्मसः क्षिनिमादुर्भाषो मरश्चैति ॥ १३

सुसृतसंहिता, निदानस्थानम्, १२ ।

pruritis ; from pruritis develops sore ; in the sore malignant nodules are formed, enveloped in a film-like membrane, and from it exudates a viscous serous fluid (when the syphilitic process dips down into the subcutaneous tissue, and is complicated with indurating edema, the chancrous erosion becomes covered with '*indurated nodules*', while if the sore remains superficial and compact, the induration is spread out into a disk-like mass and is called *parchment-like chancre*. Parchment-like chancres are mostly found on the integument of the penis and sometimes on the vulva. '*Indurated chancres*' are mostly found in the sulcus coronarius, particularly near the frenum. When, owing to excessive cell-increase, the chancrous erosion becomes salient above the level of the parts, it is called '*ulcus elevatum*'. *Ulcus elevatum* becomes covered with a film-like membrane, having a color which is a mixture of cream with a light-green tint which degenerates into brownish black, if the membrane is not shed and exists for a long period. But if an antiseptic or iodoform is used, it melts away, leaving an erosive chancrous surface. This is known as '*chancre with the cream and the green-colored membrane*'. This (chancrous nodule) kills

virility and destroys the penis (*phagedenic chancre*); the lesion infecting the vulva of woman produces soft, foul-smelling, umbrella-like (circumscribed) nodular chancre from which a viscid serous fluid exudates; and this contagion ascending upward, produces gummata in the ear, eye, nose and throat. The *gummata* of the ear cause deafness, otalgia and suppuration of the ear (gumma of the auricle leads at times to deep ulceration and destruction of cartilage; gummata on the membrane tympani occasionally cause the destruction of the membrane with ulceration; condylomata of the meatus causes severe pain with tension and fullness and deafness may be produced merely by the mechanical closure of the meatus, but the drum membrane occasionally becomes inflamed and may suppurate. Suppurative inflammation (*Otitis media suppurativa*) occurs in syphilitic subjects as the direct result of the syphilitic manifestations in the naso-pharynx, and also from other causes, but the syphilitic dyscrasia is a serious complication). In the (gummatous syphilitic) affection of the eye there is obstruction of the palpebra (*Tarsitis syphilitica*=gummatous infiltration of the tarsus; ulcerated syphilitic mucous patches on the free margin of

the lower eyelid is commoner), ophthalmalgia, lippitude (in Iritis gummosa, the exudation is gelatinous, made up of fine filaments which may be absorbed without alterations in appearance or may be changed into a bluish-white homogenous mass), and blindness (amblyopia=partial loss of vision, amaurosis=complete loss of vision in syphilis of the optic nerve, which is marked by visible changes in the papilla through: (1) choked disk or papillitis as a symptom of various intracranial processes; (2) neuro-retinitis descendens, accompanying the various changes in the brain and its meninges which have extended along the sheath of the optic nerve, or due to gumma; (3) atrophy of the optic nerve may take place either as a result of choked disk, neuritis descendens or inflammatory degeneration). Nasal (syphilitic) affection causes catarrh (the pituitary membrane may be the seat of erythema, superficial ulcerations and mucous patches which give rise to symptoms of ordinary catarrh), excessive sneezing (as a reflex excited by the irritation of the nasal mucous membrane by syphilitic erythema, mucous patches, condylomata, gummata or ulcerations), dyspnea (difficulty in breathing results from mechanical obstruction, caused

by the swollen folds or in the development of adenoids stopping up the nasal passages as may be seen in congenital syphilis), ulcer of the septum (if a gumma on the septum breaks down and ulcerates, plugs or casts of inspissated mucous, mixed with blood and pus of a very disagreeable appearance and an almost intolerable odor are discharged, especially if the necrosis of the bone has occurred. Should the lesion involve the vomer extensively, characteristically syphilitic flattening of the nose may be produced by the falling in of the bridge. The sense of smell is impaired by the failure of the odorous particles to reach the olfactory tract, owing to the obstruction of crusts and plugs of putrefying inspissated mucous), nasal voice (owing to the obstruction of the eustachian tube and nasal passages by swollen folds, gummata or condylomata) and headache (syphilitic neuralgia, the headaches being due to the lesion of the meninges which are supplied by the ramification of the trigeminal nerve : it is a very characteristic symptom of syphilis). Affections in the pharynx, larynx and palate, cause hoarseness of voice (huskiness of the voice is found in the syphilitic erythema of the larynx, and the phonation is interfered with, ranging from slight

hoarseness to complete aphonia according to the extent of ulceration), ageusia (loss of taste occurs with the ulceration and destruction of the gustatory nerve or the nerve endings on the tongue), and the ulceration of buccal cavity (mucous patches, gummata, etc.)” *Subrula* II 2. 15¹⁷⁴

“In ‘*udāvarta*’ (*dysmenorrhea*) foamy (menstrual) blood is discharged with colicky spasm (colicky *dysmenorrhea* results from the attempt of the uterus to expel foreign bodies as squamous pellicles, epithelial cells, blood clots, mucous membrane and exudations, originating either from neoplasms or inflammation, which is prevented from freely flowing out with the menstrual

174. प्रकुपितास्तु दोषा मंदमभिप्रपन्ना मांसशोषिते प्रदूष्य कष्टं जनयन्ति, ततः कण्डूयन्तात् क्षते सत्तुपजायते, तस्मिन् क्षते दुष्टमांसजाः प्रराहाः पिच्छिलरुधिर-
स्त्राविथो जायन्ते कृश्चकिनोऽभ्यन्तरस्तुपरिष्ठादाः । ते तु श्रेणी गिनाशयन्युपपन्नानि च
पुंस्त्वम्, योनिमभिप्रपन्नाः सुकुमारान् दुर्गन्धान् पिच्छिलरुधिरस्त्राविथोऽपि वाकारान्
करारान् जनयन्ति त एवोर्ध्वमांगताः श्रोत्रादिप्राणवदनेष्वर्थांस्तुपनिर्व्वर्तयन्ति । तत्र
कर्णजेषु बाधित्यं दुर्लभं पूतिकर्षता च । नेदजेषु वक्त्रावरोधो वेदनाकाक्षो
दर्शननाशश्च । प्रःथजेषु प्रतिश्यायोऽतिमात्रं चक्षुः कृच्छ्रोच्छ्वासता पूतिगन्धं सानु-
नासिकवाक्पल्लं शिरादुःखञ्च । वक्त्रजेषु कण्ठोद्धतान्नामन्यतमस्पर्शैर्गर्भदवाक्यता
रसाद्यानं शुल्लरोमाश्च भवन्ति । व्यानस्तु प्रकुपितः श्लेष्माप्यं परिगृह्य बहिःस्त्रिराशि
कोलवदंशोऽपि भिर्व्यनयन्ति तानि चर्मकोलान्दर्शासीत्याचक्षते ॥ १५

सुसुप्तसंज्ञिता, निदानसंग्रह, २ ।

blood, by some obstruction as a tumor of the cervix or an atresia, caused by inflammation, following child-birth). '*Naṣṭārtava*' (ovarian lesion) causes sterility. In '*viplutā*' (*hysteralgia*), the (female) genital region is always painful. In '*pariplutā*' (*dyspareunia*), coitus is very painful (coitus may be painful to a woman due to (1) vaginismus; (2) tender carunculæ myrtiliformes, or soreness from the laceration of the hymen in a newly married woman; (3) inflammation of the vagina or the vulva; (4) disproportion in size of the penis and the vaginal orifice, especially osteum vaginæ; (5) prolapsed ovaries or uterus; (6) pelvic peritonitis, even in multiparous women). In '*vātalā*' (*vaginitis dissecans*, in which the vaginal mucous membrane becomes dry in most instances and the superficial squamous epithelium undergoes '*cornification*' and if the venereal vaginitis persists, a formation of '*acuminated condylomata*' may take place in the vagina). In *raktaksūrā* (*inflammatory ulceration* of the internal genital organs), the menstruation flows with burning sensation (burning sensation is felt as the blood flows over the inflammatory ulcerated surfaces, due generally to gonorrhea or syphilis). In '*vāminī*' (*carcinoma uteri*) sanious mucous discharge appears

with gas (leucorrhea or flour albus, a whitish discharge of a more or less viscid fluid, mucous or pus cells, is due to, '*chronic cervicitis*' and known by another name '*śveta-pradara*'). In *prosramṣint* (*colpitis emphysematosa*) the vagina is tremulous and tumorous (*colpitis emphysematosa* is distinguished by small-celled infiltration and hyperemia in the vicinity of numerous bubbles in and beneath the epithelium of the vaginal mucosa, formed perhaps by a gas-forming anærobic bacterium). In '*putragh-nī*' (*endometritis*), though there are conceptions, abortion takes place with hemorrhage (recurrent abortion is usually either syphilitic in origin, or due to endometritis from any cause or retroflexion of the uterus). In '*pittalā*' (*gonorrheal acute salpingitis*) there are intense burning pain, suppuration and fever (gonorrheal inflammation and the degenerative changes of the oviducts—salpingitis, is responsible for the frequent cases in which pregnancy, happening shortly after marriage, terminates by an abortion or so called '*one-child-sterility*'). In '*atyānandā*' (*senile vaginitis*) coitus is not enjoyed (due to gonorrheal degenerative changes, the mucosa, especially in the upper part of the canal, sheds its epithelium in patches, becomes here and there

studded with papillary granulations, shows a tendency to cicatrical contractions, and during coitus turgescence and voluptuous sensations are missing). In *karpini* (*neoplasms*), due to 'śleṣma and the blood' growths are formed (in vagina myomata, fibromata, sarcomata, carcinomata, and cystomata are seen; in the uterus diffuse adenomata, polypoid adenomata, fibromata, fibroid polypuses, carcomata and carcinomata are more common). In 'acharaṇā' (*vaginismus*), there is a repulsion against coitus (*vaginismus* is an abnormal sensitiveness of the external genitalia which may occasionally develop to spasmodic contraction of the constrictor, cunni, the levator ani and the muscles of the entire pelvic floor; nervous virgins on the wedding night might be its subjects if brutal attacks are made by inconsiderate husbands, if they have got leathery hymen or especially in women in whom the vulva extends far forward, so that the urethral and hymenial orifices lie upon the symphysis or the ligamentum and arquatium and such women are mostly sterile, even if cohabitation in spite of the pain is enforced). 'Aticharaṇā yoni' (female sexual apparatus habituated to excessive copulation) due to excessive coitus, is neither capable of conception (it is well known

that courtesans and prostitutes who have not contracted venereal diseases are also usually sterile). In '*śleṣmalā*' (*pruritus vulvæ*), the vulva is gummy, pruritic and chilly (vulvar pruritis may originate from various causes, as acne, eczema, acrid gonorrheal discharges from the vagina, or the high uric acid containing or sugar-laden urine may exercise a continuous irritation, the decomposed and stagnated secretion makes the genital apparatus sticky, and it should be removed as in all other local lesion by frequent irrigations with weak antiseptic solutions as lysole one per cent, thymol one-tenth of a per cent, or sublimate one-twentieth of a per cent). In '*śaṇḍī*' a woman does not menstruate, her breasts are very little developed and during coitus, the vagina appears rough (*infantilismus genitalium* in which the uterus and the ovaries are incompletely developed, or androgynous masculine *pseudohermaphroditism* in which the penis is rudimentary and perforate, the scrotum fused and empty, and the central resembling the labia majora, together with the absence of testicles and the development of large breasts all conspire to convey the impression of the female sex). If a maiden with a narrow vaginal orifice has copulation with a man of very large

penis, and a fruit-like tumor is formed, it is called 'phalini' (cervicitis ; it may be also provoked by the repeated use of nodular condom)". *Suśruta* VI. 38. 5-8¹⁷⁵.

It has been often questioned whether the 'upadaṃśa' of Charaka and Suśruta is really

175. सा फेनिलमुदावर्त्ता रजः कृच्छ्रेण सुचति ॥
 वन्धा नष्टार्त्तवां विद्याभिभृतां नित्यवेदनाम् ॥
 परिभृतायां भवति वाय्वधर्म्मो रजा भृशम् ॥
 वातला कर्कशा सन्धा शूलनिक्षोदपौडिता ॥
 सदाहं प्रकिरत्यज्ञं यस्याः सा लोहितचरा ॥
 सवातमुद्गिरिद्बीजं वामिनो रजसा युतम् ॥
 प्रज्ञं सिनौ स्पन्दते तु क्षोभिता दुःप्रसूया या ॥
 स्थितं स्थितं हन्ति गर्भं पुनर्ग्री रक्तसंज्ञवात् ॥
 अत्यर्थं पित्तला योनिर्दाहपाकज्वरान्विता ।
 चतसृष्वपि चाद्यासु पित्तलिङ्गोष्णयो भवेत् ॥ ६
 अत्यानन्दा न सन्तोषं वाय्वधर्म्मेण गच्छति ॥
 कर्षिन्वा कर्षिका योनौ श्लेष्माद्यग्न्यान् जायते ॥
 मैथुनाचरणात् पूर्वा पुरुषादतिरिच्यते ॥
 बहुश्रुतिचरणादन्धा बीजं न विन्दति ॥
 श्लेष्मला पिच्छला योनिः कण्डयुक्तातिशीतला ॥
 चतसृष्वपि चाद्यासु श्लेष्मलिङ्गोष्णितिर्भवेत् ॥ ७
 अनात्तवसना यष्टो खरन्पर्शा च मैथुने ॥
 अतिक्वाथन्दीतायास्तद्व्याः फलिनी भवेत् ॥

syphilis and whether the disease was known in ancient India before it was introduced into India by the Portuguese in the sixteenth century and is described graphically in *Bhāva-Prakāśa*, a work of the same age, as '*phiraṅga-roga*', the disease of the Franks, by which name Europeans were known in India, identical with the '*mal Francais or morbus gallicus*' by which it was known all over Europe.

It is well known that during the return voyage of Cristoval Colon (Christopher Columbus) from West Indies to Spain, many of the sailors who had intercourse with the Indian women of the Islands, developed specific lesions of syphilis, and they were treated on landing by Ruy Diaz de Isla who has left clinical pictures of the lesions, typical of syphilis as known to-day. In the year 1492 Cristoval Colon sailed across the Atlantic and discovered some of the outlying islands of Central America. On the fourth of January, 1493, he sailed from the West Indies on his return to Spain which was reached in the following March. Many of the sailors were treated on landing for a new disease, which is now identified with syphilis, and the symptoms of which appeared on the shipboard before their landing. On the fourteenth of June of the year

following, Nicholas Scyllatius reported an epidemic of syphilis. Soon after this Gonzalez Fernandez de Cordova, left Spain for Italy, where in a second campaign, his troops were brought into contact with those of the French. The French army numbering about 8 to 10 thousand soldiers, recruited from all parts of Europe, crossed into Piedmont on the eighth of December, in an expedition against Naples. According to the fashion of the day both the Spanish and the French army were accompanied by numerous courtesans and prostitutes for the entertainment of the soldiery. Nor was this enough. It is said that when the French soldiers reached Naples, in the intoxication of victory and unrestrained license of the age, they pillaged the convents and the homes of the rich, and spared neither the nuns nor the virgins. The army quartered in many important Italian and French cities on its return journey, left behind always in its track the '*fearful scourge of God*,' as it was called by the Church, and with the dispersal of the army, as the soldiers returned to their homes in all parts of Europe, the disease began to spread like a plague, sparing neither the cardinals, royalties nor the laity. It was known by different names, as the '*malady of*

the Neapolitans, Portuguesse, or Spainards,' but it was '*par excellence*' known as the disease of the French (*morbus gallicus*). And one thing is clear that the history of modern syphilis can be traced step by step to the Neapolitan expedition of the French monarch Charles VIII. Bones have been exhumed of the ancient Indians, in scattered parts of America, as Colorado and Lima, exhibiting syphilitic exostosis and the results of periostitis, osteitis, sclerosis, caries and other morbid processes.*

All this definitely proves that syphilis was endemic in America, and the sailors of Columbus contracted the disease in their sexual intercourse with the Indian women, and on their return home, from their contact, it spread gradually to the rest of Europe and the modern world. But this can not warrant the assumption that syphilis in some other modified or attenuated form was not known to the ancient world. The Old Testament, the ancient Chinese medical works, and especially Charaka and Suśruta have left incontestable testimonials of the pathogenesis, evolution and the malignant course of this fateful disease. The initial lesion with chancre,

* Peabody Museum of American Archeology and Ethnology, Cambridge, Mass.

cutaneous manifestations, laryngeal symptoms, caving in of the nasal bridge, condylomata, gummata in the nose, ears and eyes, exostoses of the bones (*apachī*), all these make a complete picture of syphilis (*Suśruta* II. 11. 15). But it may be said that if '*liṅgārśa* or *upadaṁśa*' were really syphilis, there would have been no need of writing a chapter on '*phiraṅga*' malady (morbus gallicus) with clear and systematic clinical picture of typical syphilis, by Bhāva-Miśra in his well-known '*Bhāva-Prakāśa*' after the Portuguese had introduced it in India, in addition to that of '*upadaṁśa*', thus artificially adding a disease without reason, if both were indeed identical. Strangely, '*Mādhava-Nidāna*', a work of pathology, composed between the seventh and eighth centuries, gives its seventy-seventh chapter to '*phiraṅga roga*' and the language of both '*Mādhava-Nidāna*' and '*Bhāva-Prakāśa*' is the same. It seems clear that this must have been a later interpolation, for in Mādhavakara's time, the word '*phiraṅga*' was not known. Whatever may be the case, whether the passages are spurious or '*Mādhava-nidāna*' is a much later work than it is generally believed, it must not be forgotten that the pathogenic micro-organisms do not possess the same virulence

under all circumstances. As the seeds of a plant sown in different soils—marshy, sandy, fertile, rocky or desert wastes, and according to the mineral contents of the soil, sunshine, humidity and temperature—will vary in their foliage, growth, size of the plant and the fruit, and in course of time would evolve into sub-species, so a disease germ in the history of its evolution passes through an eventful career of exuberant growth and vitality or arrested development, its life being conditioned by the nourishment it receives and the environmental influences it is subjected to. Disease is the expression of the reactions of the organism in the struggle that ensues between the invading pathogenic germs and the host at whose expense the specific germs want to live and multiply. Two organisms are never the same. The American Indians were virtually nomads who lived by hunting. Their civilization was crude and primitive. They lacked personal and communal hygiene. They knew not the comforts of advanced '*social organizations*'—progressive and well-ordered States and Empires—in which life was settled, peaceful and regulated, and there was plenty of nutrition, medical attention and hospital facilities for all. So there is no wonder that syphilis ran a very

virulent course with them. While in Asia, it became controlled and its virulence was attenuated. Moreover, in course of time a disease becomes milder as the race becomes partially immunized by the antibodies that are elaborated by the organism as a reaction of the disease and these characteristics are transmitted from generation to generation, thus developing a partial or complete racial immunity against a specific disease. A new disease is always virulent, for the body has not yet developed antibodies as a defensive mechanism against its attack. In the fifteenth century, after its introduction by the sailors of Columbus, syphilis overran Europe as a terrible epidemic. Now the European races have been partially immunized against it, and it usually runs a very mild course, even milder than what it was fifty years ago, as descriptions left by reliable medical writers unmistakably show the horrible syphilitic ravages which are almost unknown to-day. Possibly better nutrition and hygiene have been not unimportant factors. When syphilis was first introduced in the Sandwich Islands, more than half the population was exterminated by it within a short time as by a plague. So it is very likely that when the Portuguese introduced the virulent type of

European syphilis, it appeared almost like a new disease in the severity of the symptoms and malignant sequela. The etiology of the disease became more definite and certain, and therefore all the primary and tertiary manifestations of the lesion became united and related together, and not as described before as separate diseases.

“Because in the land of the Frank(European), this disease (syphilis) is very prevalent, it is called by the pathologists, ‘*phirāṅga*’ (Frank’s or European) disease. This disease is developed by the physical contact of a Frank or coitus with a Frankish woman. Its another name is ‘*gandha-roga*’ (the disease that smells). It is contagious. After the incubation of the disease, the ‘*vāta*’ becomes affected, and according to the symptom, the lesion of the ‘*vāta*’ is to be determined.

“Syphilis manifests itself in three ways, externally, internally, or both combined. External syphilis manifests as a slightly painful papule which ulcerates like a tumor, but is easily curable. Internally gumma appears like tumescence at the joints with pain and inflammation and is very difficult to cure.

“Emaciation, loss of strength, caving in of the nasal bridge, anorexia, osteitis and osteocampsia are the symptoms of (tertiary) syphilis.

External syphilitic eruption and uncomplicated condylomata are curable. Internal manifestation (*gummata*) of syphilis is very hard to cure. But the internal complications of syphilis in a debilitated person are incurable.

Treatment : The ancient therapeutists have said that the application of (calcinated and incinerated) mercury (*karpūrarasa*) positively controls (the progress of) syphilis. And if the mercury is given in the following manner, it does not cause ulceration of the mouth : Press wheat flour with water and make a cup (out of the paste); place into the cup four '*guñjas*' (the berries of *Abrus precatorius*, weighing about a grain and a half each) of mercury and make such a capsule of it that no mercury can be seen on the surface. Then rolling the capsule (enclosing mercury) on clove-powder, swallow it carefully with water, so that it does not come in contact with the teeth. Later, betel-nut should be chewed, and vegetables (consisting of leaves), acids and sodium chloride should not be indulged in. Especially fatigue, exposure to the sun, exertion and coitus must be avoided. About one-fourth of an ounce of mercury, one-fourth of an ounce of *Acacia catechu*, half an ounce of '*ākāra-karabha*' (*Echinopea echinatus* ?) and

three-fourths of an ounce of honey pounded together in a mortar should be made into seven pills. Syphilis is destroyed by taking each of the pills every morning with water. After taking the pill, acids and sea-salt should be avoided.

Fumigation : Mercury one ounce, sulphur one ounce and Embelia ribes one ounce should be pounded together and made into a paste, and seven pastils are to be made out of it. If the syphilitic is subjected to the fumigation for seven days, by putting a ball into fire each day, then syphilis is certainly cured.

Inunction : One-fourth of an ounce of mercury is to be rubbed over the body with the juice of Michelia champaka and Barleria pubiflora by hand, as long as mercury does not entirely disappear. The fomentation is to be applied (to facilitate absorption) and if thus avoiding acids and sea-salt, inunction is applied for seven days, syphilis is cured." *Bhāva-prakāśa* IV. 50. 1-20¹⁷⁶.

176. फिरङ्गसंश्लेक्षे देशे बाहुष्ये नैव यद्भवेत् ।

तस्मात् फिरङ्ग इत्युक्तो व्याधिर्यार्धिविशारदः ॥ १

विप्रकृष्टनिदानमाह—गन्धरोगः फिरङ्गोऽयं जायते देशिनां भुवनम् ।

फिरङ्गिनोऽङ्गसंश्लेक्षे फिरङ्गिण्याः प्रसङ्गतः ॥ व्याधिरागन्तुजो यत्र दोषाश्चामन-
संक्रमः । भवेत्स लक्ष्येतेषां लक्ष्यैर्मिषजां वरः ॥ २।१

रूपमाह—किरङ्गस्त्रिविधो ज्ञेयो बाह्य आभ्यन्तरकृपा । बहिरन्तर्भव्यापि
तेषां लिङ्गानि च त्रये ॥ तत्र बाह्यः किरङ्गः स्याद्विष्कोटसदृशोऽल्पवक्त्रः । कुटितो
त्रयवर्षेद्यः सुखसाधोऽपि स भूतः ॥ सन्निष्ठाभ्यन्तरः स स्यादामवात इव व्यथाम् ।
शोषश्च जनयेदेष कटसाधो दुधैः भूतः ॥ ४—६

उपद्रवानाह—कार्श्यं तलक्षयो नासाभङ्गो वक्त्रेण मन्दता । अस्थिशोभो-
ऽस्थिवक्त्रं किरङ्गोपद्रवा अनी ॥ ७

साम्यत्वादिकमाह—बहिर्भवो भवेत् साधो नवीनो निरुपद्रवः ।
आभ्यन्तरस्तु कटं न साध्यः स्यादयमामयः ॥ बहिरन्तर्भवो जीर्णः चौचस्योपद्रवैर्युतः ।
व्याप्तो व्याधिरमाधोऽग्रनित्याहुर्मुनयः पुरा ॥ ८६ इति किरङ्गनिदानम् ।

अथ किरङ्गस्य चिकित्सा (कर्पूररसः)—किरङ्गसंज्ञकं रोगं
रसकर्पूरसंज्ञकः । अशयं नाशयेदेतद्द्रव्यं पूर्वचिकित्सकाः ॥ लिप्यते रसकर्पूर-
प्राशने विधिस्ततः । अनेन विधिना स्वादेन्मुखे शोधं न विन्दति ॥ गोधूमचूर्णं
सस्त्रीयं विदध्यात् सूक्ष्मकूपिकाम् । तन्मध्ये निःक्षिपेत् सूतं चतुर्गुणमितं भिषक् ॥
ततस्तु गुटिकां कुप्याद् यथा न दृश्यते बहिः । सूक्ष्मचूर्णं लवणस्य तां बटीमवधूययेत् ॥
दन्तवर्षो यथा न स्यात् तथा तारुण्यसा मिलेत् । तान्त्र्यं भक्षयेत् पश्चाच्छाकाक्षलवणान्
त्यजेत् ॥ श्रममातपमध्मानं विशेषात् स्त्रीनिषेधकम् ॥ १०—१४

सप्तसालिषटो—पारददण्डमानः स्यात् स्रदिरदण्डसंज्ञितः । आकार-
करभस्यापि यास्रदण्डयोन्मितः ॥ दण्डयोन्मितं चौद्रं खल्वे सर्वं विनिःक्षिपेत् ।
संमर्द्य तस्य सर्वस्य कुप्यात् सप्तबटीभिर्वक्त्रं । स रोगी भक्षयेत् प्रातरेकोकामम्बुना
बटीम् । वज्रयेदक्षलवणं किरङ्गस्य नश्यति ॥ १५—१७

धूमप्रयोगः—पारदः कर्षमाणः स्यात्तावानेव हि गन्धकः । तच्छूलायाच-
मावाः स्युरेषां कुर्वीत कञ्जलीम् ॥ तस्याः सप्तबटीः कुप्यात्ताभिर्धूमं प्रयोजयेत् ।
दिनानि सप्त तेन स्यात् किरङ्गाग्नौ न संशयः ॥ १८—१९ इति धूमप्रयोगः ।

पीतपुष्पवलापव्रसैष्टमितं रसम् । उल्लाभां महैशितावदयावत् सूती न
दृश्यते ॥ ततः संक्षेदयेत्तत्तावर्षं वासरसप्तकम् । त्यजेत्तत्तत्तत्तत् किरङ्गस्य
नश्यति ॥
भावप्रकाशः, मध्यखण्ड, ४ ।

VI.—THERAPEUTICS.

“The agent that normalises a diseased function is called ‘*therapeutics*’ and the application of it is the duty of the physician. That the principles of the body remain normal and do not become abnormal, is the object of ‘*therapeutics*.”

Charaka I. 16. 18¹⁷⁷

Disease is frequently caused directly and by certain states of the blood. If certain principles in the blood are diminished, due either to faulty dietary or pathogenesis, as iron or thyroid secretion which are necessary for metabolic processes, morbid conditions of health result from these causes, known as anemia (*oligochromemia*, lacking sufficient iron for the formation of hemoglobin), or myxedema (due to deficiency of thyroid secretion). They can be easily remedied by giving iron in an assimilable form as milk, meat or spinach, or thyroid glands or sea-weeds contain-

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याभिः क्रियाभिर्जायन्ते शरीरे धातवः समानाः ।

सा चिकित्सा विकाराणां कर्मा तद्विषयां जतम् ॥

कथं शरीरे धातूनां वैषम्यं न भवेदिति ।

समानाश्चानुबन्धः स्यादित्यर्थः क्रियते क्रिया ॥

चरकसंहिता, सूक्ष्मानु, १६ ।

ing iodine as *Durvillae utilis*, *Lamianria sacarina* etc., so that the thyroid glands may manufacture the necessary colloids from them. The blood being faulty, the tissues are ill-nourished and lack the necessary resisting power against the invasion of pathogenic micro-organisms. (2) There may be also disorders due to the excess of substances in the blood as 'glucose' in glycosuria, or uric acid in gouty diathesis. If diabetes is due to defective carbohydrate metabolism, it can be cured by withholding carbohydrates from the diet, if begun when the case is not too advanced. Colchicum seems to remove the pain symptoms of gout. (3) There may be foreign bodies in the blood and their abnormal secretions, as the germs of malaria (*Plasmodium malarie*), leprosy (*Bacillus lepræ*) or syphilis (*Spirocheta pallida*). Quinine kills the malarial spores of plasmodia, chaulmoogra and its derivatives the lepra bacilli, and mercury the syphilitic spirocheta.

It is very likely that a majority of the drugs that have found place in the '*Materia Medica*' of various countries, have very little positive value. They are more or less empirical. If they cure at all, it is but symptomatic, if not psycho-therapeutic, and can not be radical.

Many people subconsciously, as in various other superstitions, feel assured against a disease, if they have taken some kind of medicine. Lacking faith in religion, they confide in pseudo-science, for the word '*science*' has a magic charm and the people are swayed by it, as by religion in the past, and the medicine-man is but a successor of the priest. That is why, the list of drugs has swelled in volume and a new drug is being added every day. The fact is that a medicine can not destroy the pathogenic germs lodged in the tissues or blood-corpuscles without destroying the tissues, or, the corpuscles. If the chemical is strong enough to kill the pathogenic micro-organisms, it might cure the disease, but it is apt to kill the patient. Of all medicines in all '*Materia Medica*', only quinine, chaulmoogra and mercury have proved to be of some value in the treatment of malaria, leprosy and syphilis. Yet the sequela of their treatment are many and are injurious to the organism. If the organism needs iron or phosphorus, it is not only useless, but harmful, to give inorganic ferric or phosphoric salts or compounds, for the body is incapable of assimilating them and they throw additional burden upon the over-worked kidney to eliminate them.

However, from this, it will be unjust to conclude that therapeutics is a failure. As far as medication is concerned, it is certainly getting obsolete, as the people are growing in intelligence, and learning reactions of drugs. But the disease is being controlled and conquered by hygiene, prophylaxis, dietary, serum therapy, opo therapy, surgery and antisepsis,

Ancient Hindu Medicine was justified in emphasizing the cardinal value of hygiene and dietary in the treatment of disease, by promoting the resisting power of the organism, to enable it to cure itself of the pathogenesis, Charaka severely warns against the prescription of drugs whose action is not well-known and thoroughly tested :—

“The organism suffers if drugs are given whose names, description and actions are not well-known, or if known, has not been properly given (chemical incompatibility or over-dose). By proper chemical combination and application, even a deadly poison can become a good medicine, while a good drug by improper combination (chemical incompatibility) and application can be venomously injurious. Therefore any intelligent person who wishes cure and long life,

should not take an improper medicine. *Charaka* I. 1. 48¹⁷⁹.

"Medicines are derived from three sources—animals, minerals and vegetables." *Charaka* I. 1. 35¹⁷⁹.

"Of animals, honey, milk and milk-products, bile, fat, bone-marrow, blood, flesh, excreta, urine, skin (including membrane), semen, bone, tendon, horn, claw, hoof, hair, down and gall-stone are used in medicine.

Gold, five metals (silver, copper, tin, lead and iron) and their oxides, sand, carbonate of lime, arsenous disulphide, arsenous sulphide, precious stone (diamond), sea-salt, ferric carbonate of calcium and antimony (are used in medicine of the minerals).

Vegetable drugs are from four sources : '*vanas-*

178. औषधं ज्ञानमिच्छातं नामरूपगुणैस्त्रिभिः ।
 विज्ञातमपि द्रव्यं क्लमनार्थायोपपद्यते ॥
 योगादपि विषं तीक्ष्णं उत्तमं भेषजं भवेत् ।
 भेषजं वापि द्रव्यं तीक्ष्णं सम्पद्यते विषम् ॥
 तस्मान्न भिषजा युक्तं युक्तिवाह्येन भेषजम् ।
 धीमता किञ्चिदादेयं जीवितारोग्यकारिणम् ॥

चरकसंहिता, स्वस्थानम्, १ ।

179. तत्तत्पुनस्त्रिविधं ज्ञेयं जातमोहिदपार्थिवम् ।

pati' (*gymnosperms*), '*vānaspatya*' (*angiosperms*), '*oṣadhi*' (*herbs*) and '*virudh*' (*archegoniates*). Those who have fruits without flowers are called '*vanaspati*' (*gymnosperms*). Those whose fruits develop from flowers, are called *vānaspatya* (*angiosperms*). Those who only persist for the development of seeds are called '*oṣadhi*' (*herbs*). Those which expand (*pratāna*, by climbing, as the fern *Lygodium palmatum*) are called, '*virudh*' (*archegoniates*.)" *Charaka* I. 1. 36-38¹³⁰.

"Root (*mūla*), bark (*tvak*), pith (*sāra*), gum-resin (*niryāsa*), culm (*nāḍa*), juice (*svarasa*), leaves and flowering top (*pallava*), vegetable alkali (*kṣāra*), milky exudation (*kṣīra*), fruit (*phala*), flower (*puṣpa*), ash (*bhasma*), oil (*taila*),

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मधूनि गोरमाः पित्तं वसा मज्जासृगामिषम् ॥

विष्मत्तुचर्च्चरितोऽस्थिश्चायुश्चङ्गनखाः खुरा ।

अङ्गमेभ्यः प्रयुज्यन्ते केशलोमानि रोचनाः ॥

सूक्ष्मं समलाः पञ्चलोद्भाः सप्तिकता सुधा ।

मनःशिलाणि मणयो लवणं गेरिकाञ्जने ॥

भौममीषधमुद्दिष्टमीद्भिदन्तु षट्पञ्चधम् ।

वनस्पतिस्तथा वीरुद्धानस्पत्यस्तथौषधिः ॥

फलैर्वनस्पतिः पुष्पैर्व्यानस्पत्यः फलैरपि ।

औषध्यः फलपाकान्ताः प्रतानैर्वीरुधः क्षृताः ॥

चरक-संहिता, सूत्र-स्थानम्, १ ।

thorn (*kanṭaka*, for opening superficial cutaneous abscess), leaf (*patra*), flower-bud (*śiṅga*), rhizome and bulb (*kanda*), and bud (*praroḥa* = undeveloped shoot) of plants are used as medicines." *Charaka* I. 1. 38¹⁸¹.

"The fluid that is extracted by pressing any (vegetable or animal) substance in a machine, is called juice (*svarasa*). Anything that is beaten into semi-solid consistency in a mortar, is called *paste* (*kalka*). The liquid preparation of any (vegetable) drug, obtained by boiling with water, is called by the therapists, *Decoction* (*śrta*). The preparation that comes out by steeping a (crude) drug in cold water, and passing it through a sieve after exposing it to the dew-drops of the night (that is the crude drug is to be kept soaked in water at least for 12 hours), is called *Infusion* (*śīta*). If any ground drug is poured into boiling water, and the preparation is passed through a sieve, it is called, *Tea* (*phāṇṭa*)." *Charaka* I. 4. 8¹⁸².

181. मूलत्वक् सारनिर्व्यास-नाड-स्वरसपल्लावाः ।
 चाराः चौरं फलं पुष्पं भस्म तैलानि कष्टकाः ।
 पद्माणि गुग्गुलाः कन्दाश्च प्ररोहयौहिदो गणः ॥
 चरक-संहिता, सूत्र-स्थानम्. १ ।
182. यन्मप्रपोडनाद्व्यादसः स्वस उच्यते ।
 यत् पिष्टं रसपिष्टानां तत् कल्कं परिकीर्तितम् ॥

Cerebral Sedatives : "Fructus *Achyranthes aspera* (*apāmārga*), *Piper longum* (*pippalī*), *Piper nigrum* (*maricha*), *Embelia ribes* (*riḍaṅga*), *Moringa pterygosperma* (*śigra*), *Sinapis alba* (*saṣarpa*), *Xanthoxylon alatum* (*tumburu*), *Nigella sativa* (*ajḍī*), *Ocimum gratissimum* (*ajagandhā*), *Salvadora persica* (*pīlu*), *Elletaria major* (*elā*), *Piper aurantiacum* (*hareṇukā*), cardamomi semina (*prthvīkā*), *Ocimum basilicum* (*surasā*) *Clitoria ternatea* (*śvetā*), *Ocimum sanctum* (*kuṭheruka*) *Ocimum villosum* (*phañijjhaka*), fructus *Albizia lebbek* (*śirīṣa*), *Allium sativum* (*laṣuna*), *Curcuma longa* and *Berberis asiatica* (*haridrū* and *dāru-haridrā*), sodium chloride and rock-salt (*lavaṇa-dvaya*), *Cardiospermum halicacabum* (*jyotiṣmatī*), and *zingiber officinale* (*nāgara*) these are *Cerebral Sedatives*. These are also used in migraine, cephalalgia, catarrh, helmet-headache, syphilitic gumma (*krimivyūddhi*-bacterial lesion ?), apoplexy, anosmia and epilepsy.

Emetics : *Randia dumetorum* (*madana*), Gly-

वञ्जीतु कथितं द्रव्यं शननाइक्षित्सकः ।

द्रव्यादापोयितापोये तत् पुनर्निशि संस्थितात् ॥

कषायो योऽभिनिर्याति स शीतः समुदाहृतः ।

क्षिप्तोऽप्यतोये वृद्धितं तत् फाद्यं परिकीर्तितम् ॥

चरक-संहिता, सूत्रस्थानम्, ४ ।

cyrrhiza glabra (*madhuka*), Azadirachta indica (*nimba*), Achyranthes aspera (*jīmūta*), Achyranthes fruticosa (*krta-vedana*), Piper longum (*pippalī*), Mallotus philippinensis (*kūṭaja*), Citrullus colocynthis (*ikṣvāku*), Elletaria major (*elā*) and Achyranthes obtusifolia (*dhāmārgava*) are to be used as Emetics in proper doses, in intestinal, 'pitta' and 'śleṣma' diseases without causing any injury to the organism.

Purgatives : Ipomoea (Convolvulus), turpethum (*trivrt*), Terminalia chebula, Terminalia bellerica (Myrobalan) and Emblica (Phyllanthus) officinalis (*tri-phalā*), Baliospermum montanum (*dantī*), Ipomoea caerulea (*nīlinī*), Abrus precatorius (*saptalā*), Acorus calamus (*vacha*), Mallotus philippinensis (*kampillaka*), Clitoria ternatea (*govākṣi*), Mimosa kauki (*kṣīrīṇi*), Luffa amara (*udakīryyaka*), Salvadora persica (*pilu*), Cassia fistula (*ārāgvadhā*), Uvae passae (*drākṣā*), Baliospermum indicum (*dravantī*) and Barringtonia acutangula (*nichula*) are to be used as *Purgatives* in intestinal diseases, Sterospermum suaveolens (*pāṭali*), Premna serratifolia (*agnimantha*), Aegle marmelos (*vilva*), Oroxylum (Calosanthus), indicum (*śyonāka*), Gmelina arborea (*kāśmāryya*), Desmodium triflorum (*śālaparnī*), Uraria logopodioides (*prēniparnī*), solanum xanthocarpum (*midigdhikā*),

Sida cordifolia (*calā*), *Tribulus lanuginosus* (*asvadamṣṭrā*) *Solanum indicum* (*vrhati*), *Ricinus communis* (*eraṇḍa*), *Boerhaavia procumbens* (*punarnavā*), *Hordeum hexastichum* (*yava*), *Dolichos uniflorus* (*kulattha*), *Zizyphus jujuba* (*kola*), *Tinospora cordifolia* (*guluchī*), *Randia dumentorum* (*madana*), *Butea frondosa* (*palāśa*), *Andropogon citratus* (*karttṛṇa*), oils and salts are to be used (as purgatives) in constipation and in the formation of the feces." *Charaka* I. 2. 2-5¹⁸³.

183. अगमार्गस्य बोजानि पिप्पली मरिचानि च ।
 विङ्कणान्यथ शिग्रूनि सर्षपास्तम्बकणि च ॥
 अजानाञ्जलगन्धाश्च पीलून्धेलाहरिणुकाम् ।
 पृथ्वीकां सुरसां श्वेतां कुठेरकफणिज्भक्तौ ॥
 त्रिरीषधोजं लगुनं हरिद्रे लवणहयम् ।
 व्योतिष्मतां नागरश्च दद्याच्छीर्षविरचने ॥
 गौरधं शिरसः यूले पीनसेऽर्द्धादभेदके ।
 क्रान्तिव्याधाधनञ्चारे त्राणनाम्नि प्रमोदके ॥
 मदनं रुधिरं निम्बं जीमूतं कृतवेधनम् ।
 पिप्पलकुटजोस्त्राकुण्डलां धामार्गवाणि च ॥
 उपस्थिते श्लेष्मपिप्पे व्याधावामाशयाश्रये ।
 वमनाथं प्रयुञ्जात भिषग् देहमद्रूषयन् ॥
 विहतां विफणां दन्तौ नोलिनीं सप्तलां वचाम् ।
 कम्पिल्लकं गवाक्षीञ्च चोरिणीमुदकीर्यकाम् ॥

Antiparasitics : Cassia fistula (*āraṇḍha*), Cassia tora (*aiḍagaja*), Luffa amara, Justicia adhatoda (*vāsā*), Tinospora cordifolia, Randia dumentorum, Curuma longa, Berberis asiatica, Acacia gummifera (*śryāhva*), Cedrus deodara (*surāhva*), Acacia catechu (*khadira*), Tomentosa latifolia (*dḥava*), Azadirachta indica, Embelia indica, Nerium odoratum (*karavīraka*), Betula bhojpattra (*bhūrīja*), Allium sativum, Albizzia lebbek, Laurus cassia (*lomaśa*), Balsamodendron pubescens (*guggulu*), Moringa (*zeylanica*) pterygosperma (*kriśṇagandhā*), Ocimum villosum, Mallotus philippinensis, Alstonia scholaris, Salvadora persica, Saussurea lappa (*kuṣṭha*), Jasminum grandiflorum (*sumana*), Acorus calamus, Piper angustifolium (*reṇukā*), Ipomoea turpethum, Baliospermum montanum, Acaju officinalis

पोलून्यारुग्धं द्राक्षां द्रवन्तीं निचुलानि च ।

पक्षाशयगते दोषे विरेकार्थं प्रयोजयेत् ॥

पाटलिच्चाग्निमथ्यच्च विलं श्लोणाकमेव च ।

काश्मर्थं शालपर्णीश्च वृन्निपर्णीं निदिग्धिकाम् ॥

बलां चदंष्ट्रां वृद्धतीक्ष्णं सपुनर्नवम् ।

यवान् कुलत्थान् कोलानि गुडूचीं मदनानि च ॥

पलाशं कर्तृणश्चैव खेडांश्च लवणानि च ।

उदावर्ते विबन्धेषु युक्ताग्रादास्यापनेषु च ॥

चरकसंहिता, सूक्ष्म-स्थानम् २

(*bhallātaka*), ferric calcium carbonate (*gairika*), antimonious sulphide (*añjana*), arsenous sulphide (*āla*), arsenous disulphide (*manahśilā*), fuliginis alcalina (*grha-dhūma* = a complex empyreumatic substance, deposited from smoke, made up chiefly of a resinous substance combined with lactic acid, carbonous matters and creasote, besides various mineral salts), *Elletaria major* (*elā*), ferric sulphide (*kāśīsa*), *Symplocos racemosa* (*lodhra*), *Terminalia arjuna* (*arjjuna*), *Achyranthes aspera* (*musta*) and *Shorea robusta* (*sarjja*) are kept together with the bovine gallstone for seven days, and then having crushed the gallstone, the linimenta is mixed with *oleum sinapis*, and applied over the body as an unguent, then obstinate psoriasis, leucoderma, alopecia, keloid, *tinea imbricata*, *scrofulide*, *fistula-in-ano* and *eczema* are cured within a short time.

Saussurea lappa, *Curcuma longa*, *Berberis asiatica*, *Ocimum basilicum*, *Trichosanthes dioica*, *Azadirachta indica*, *Withania somnifera* (*āsvagandhā*), *Cedrus deodara*, *Moringa pterygosperma*, *Sinapis alba*, *Xanthoxylon budrunga* (*tumvurū*), *Coriandri fructus*, *Scrupus capsularis* (*vanya*) and *Andropogon acicularis* (*chandā*) are to be ground in equal proportion and mixed with whey, and if then it be rubbed over the

body as an unguent, pruritus, eruption, urticaria and tumescence become cured.

Saussurea auriculata, Coccus cordifolius (*amṛta*), Hydrocarpus kurzii or copper-sulphide (*asanga*), Berberis asiatica, ferric sulphide, gummi Rotleria tinctoria (*kampillaka*), Achyranthes aspera, Symplocos racemosa, Andropogon shoenanthus (*sauyandhika*), Shorea robusta, gummi Vateria indica (*sarja-rasa*), Embelia indica, arsenous disulphide, arsenous sulphide, and Nerium odorum—relieve tinea imbricata, pruritus, keloid, eczema and scrofulide, if these are ground and rubbed over the body, smeared with unguents." *Charaka* I. 3. 2-4 ¹⁸⁴.

184. चारुवधः सैद्गजः करञ्जो वासा गुडुचो मदनं हरिद्रे ।

आग्राहः सुराहः खदिरो धवस निम्बो विडङ्गं करवीरकत्वक् ॥

यन्धिय भौर्ज्यो लघुनः शिरीषः सलोमशो गुग्गुलुहृण्यगन्धं ।

फणिज्जम्बको वरसकसतपथ्यो पौल्लो न कुष्ठं सुमनःप्रवत्साः ॥

वचासुरेष्ठस्त्रिभुता निकुम्भो भल्लातकं वैरिकमञ्जनाम् ।

मनःशिलाहो यक्षधूम एलाकाशीशलोभाज्जुगुहासज्जाः ॥

इत्यर्बुदपैर्विहिताः पङ्केते गोपितपेताः पुनरेव पिष्टाः ।

सिद्धाः परं सर्षपतैलयुक्ताश्चूर्णप्रदेहा भिषजा प्रयोज्याः ॥

कुष्ठानि कृष्णाणि नयं किलाशं सुरेन्द्रलुप्तं किटिमं सदद्दु ।

भगन्दराशां स्तपथो सपामां हन्तुः प्रयुक्तास्त्वचिराद्रराणाम् ॥

कुष्ठं हरिद्रे सुरसं पटोलं निम्बान्गन्धं सुरदाहं शिषु ।

ससर्षपं तुल्युधान्यवन्धं चण्डाच चर्षाणि समानि कुर्यात् ॥

Anodynes : “Radix Nymphaea lotus, Cedrus deodara, Saussurea lappa, Glycyrrhiza glabra, Elletaria major, Nelumbium speciosum (*kamala*) Nymphaea stellata (*utpala*), Aquilaria agallocha (*loha*), Typha angustifolia (*erakā*), Nymphaea lotus (*padmaka*), Andropogon acicularis—if these are used as a liniment, headache is relieved. Aërides tessalatum (*rāsnā*), Curcuma longa, Berberis asiatica, Valeriana dioica, Foeniculum vulgare and Anisi fructus, Cedrus deodara, Saccharum officinarum and Cælogyne ovalis (*jīvantī = cæla*) if compounded and mixed with clarified butter and oleum sesami, and applied as a liniment after warming it, pain is relieved.

Demulcents : Musci (*śaivāla*), Nymphaea lotus, Nymphaea stellata, Calamus rotang (*vetra*), Calophyllum inophyllum (*tungca*), radix Nymphaea lotus, Andropogon muricatum, Symplocos racemosa, Aglaia edulis, Pterocarpus

तैलक्रपिष्टैः प्रघ्नन् शरीरं तैलान्तामुद्धर्तयितुं यतेत ।

तेनास्य कण्डूः पिङ्गकाः सक्तीठाः कुष्ठानि शोफाश्च शनं व्रजन्ति ॥

कुष्ठान्तासङ्ककटङ्कटैरी काशीशकम्पिङ्गकमुसलोघ्नम् ।

सीगन्धिकां सर्जरसो विङ्गकं मनःशिलां ली करवीरकत्वक् ॥

तैलान्तागावस्य कृतानि चूर्णान्येतानि दद्यादवचूर्णनार्थम् ।

दधुः सकण्डः कटिमानि पाला विचर्शिका चैव तथैति शान्तिम् ॥

चरकसंहिता, सूत्र-स्थानम्, ३ ।

santalinus, if applied as a liniment, after pasting and mixing them with clarified butter, the irritation of a burn is relieved. Ipomoea digitata (*sitā*), Rubia cordifolia, Calamus rotang, radix Nymphaea lotus, Glycyrrhiza glabra, Citrullus colocynthis (*aindrī*), Nymphaea lotus, Panicum frumentaceum (*durvā*), radix Hedysarum alhagi (*yavāsa-mūla*), Poa cynosuroides, Saccharum spontaneum (*kāśa*), and Typha angustifolia, if applied as a liniment, irritation of the skin is relieved. Lichen (*śaileyam*), Elletaria major, Aquilaria agallocha, Saussurea lappa, Andropogon acicularis, Tabernæmontana coronaria (*nata*) Cinnamonum zeilanicum (*tvak*), Cedrus deodara, Aerides tessellatum, Albizzia lebbek and Mimosa indica, if applied as a plaster on a venous bite, the burning irritation is relieved.

Diaphoretics : Albizzia lebbek, Mimosa indica, Mesua speciosa (*hema*), and Symplocos racemosa, if rubbed upon the skin in the powder form, it relieves skin-lesion and causes perspiration." *Charaka* I. 3. 16-21¹⁸⁵.

185. प्रपौष्टरोक्तं सुरदाहं कुष्ठं यस्याहमेना कमलोत्पले च ।

श्विरोक्षणायां सङ्गतः प्रदेहो जोहिरकापन्नक-चोरकैश्च ॥

राजाहुरिद्रे नक्षदं मलाहं च देवदाहपि विलोपनाच्च ।

जीवन्मिक्षुश्च सङ्गतं सतैलमाक्षिपनं पान्दरगासु कोचन ॥

Analeptics : “*Celtis orientalis minor* (*jīvaka*), *Vitis vinifera* (*ṛṣavaka*), *Leptadenia reticulata* (*medā*), *Leptadenia spartium* (*mahamedā*), *Gymnema balsamicum* (*kākolī*), *Gymnema lactiferum* (*kṣīra-kākolī*), *Phaseolus trilobus* (*mudga-parṇī*), *Teramnua labialis* (*māṣaparnī*), *Cælogyne ovalis* and *Glycyrrhiza glabra*—these ten are vitalizing astringent drugs.

Tonics : *Mimusops kauki* (*kṣīriṇī*), *Oxytelma esculentum* (*rājakaṣavaka*), *Cordia latifolia* (*valā*), *Gymnema balsamicum*, *Gymnema lactiferum*, *Cordia officinalis*, *Cordia myxa*, *Hibiscus vitifolius*, *Batatas paniculata* and *Ipomoea batatas*—these ten are tonic astringents.

Epispastics : *Cyperus rotundus*, *Saussurea lappa*, *Curcuma longa*, *Berberis asiatica*, *Acorus calamus*, *Aconytum heterophyllum*, *Picrorrhiza*

शेवालपद्मोत्पलवेतुङ्गं प्रपीच्छरोकार्थं घृणालोघ्नम् ।

प्रियङ्गु कालीयकचन्दनानि निर्व्यापयः स्यात् सद्यतः प्रदेहः ।

सितालतावेतसपद्यकानि यथ्याङ्गमैन्द्रो नलिनानि दृष्ट्या ।

यवासमूलं कुशकाशयथ निर्व्यापयः स्यात् जलमेरुका च ॥

शैलीयनीलागुबची सकुष्ठे चष्टा नतं लक् सुरदाहुराद्या ।

शीतं निहन्वादिचिरात् प्रदेहो विषं शिरीषस्तु सविण्बुवारः ॥

शिरीषलानज्जकश्चैमलोघ्नै स्वन्दीपसंस्लेदहः प्रवर्णः ।

चरक-संहिता, सूत-स्थानम्, ३५

kurroa, Plumbago zeylanica, Pongamia glabra and Ipomoea indica—these ten are reductive.

Pustulants : Convolvulus turpethum, Asclepias gigantea, Eicinus communis, Gloriosa superba, Rubia cordifolia, Plumbago zeylanica, Pongamia glabra, Andropogon acicularis, Picrorrhiza kurroa and Cleome felina—these ten cause suppuration.

Vulneraries : Glycyrrhiza glabra, Tinospora cordifolia, Uraria logopodioides, Stephania herandifolia, Mimosa pudica, Bombex malabaricum, Grisea tomentosa, Symplocos racemosa, Aglaia edulis, and Myrica sapida—these ten promote the healing of wounds.

Irritants : Piper longum, radix Piper longum, Piper chava, Plumbago zeylanica, Zingiber officinale, Rumex vesicarius, Piper nigrum, Pimpinella saxifraga, Semecarpus anacardium and Ferula asafoetida—these ten are rubefacient.

Tonics : Citrullus colocynthis, Carpopogon pruriens, Asparagus sarmentosus, Phaseolus trilobus, Convolvulus paniculatus, Withania somnifera, Desmodium triflorum, Picrorrhizza kurroa, Sida cordifolia, and Sida rhombifolia—these ten are tonics (strengthening).

Rubefacients : Pterocarpus santalinus, Calophyllum inophyllum, Nymphaea lotus, Andropo-

gon muriculatum, Glycyrrhiza glabra, Rubia cordifolia, Hemidesmus indicus, Convolvulus paniculatus, Panicum frumentaceum and Panicum dactylon—these ten bring redness to the complexion.

Expectorants: Hemidesmus indicus, radix Saccharum officinarum, Glycyrrhiza glabra, Piper longum, Uvæ passæ, Convolvulus paniculatus, Myrica sapida, Hydrocotyle asiatica, Solanum indicum, and Solanum xanthocarpum—these ten stimulate bronchial (mucous membrane).

Heart-Stimulants: Mangifera indica, Spondias mangifera, Artocarpus lakoocha, Carissa carandas, Tamarindus indica, Rumex vesicarius, Prunus acida, Prunus acacia, Punica granatum, and Citrus medica—these ten stimulate the heart.

Esfrigerants: Zingiber officinale, Plumbago zeylanica, Piper chaba, Embelia ribes, Saussurea zeylanica, Tinospora cordifolia, Acorus calamus, Cyperus rotundus, Piper longum and Trichosanthes—these ten allay thirst.

Hemostatics: Holarrhena antidysenterica, Aegle marmelos, Plumbago zeylanica, Aconitum heterophyllum, Terminalia chebula, Alhagi maurorum, Berberis asiatica, Acorus calamus, and Piper chava—these ten cure piles.

Antiparasitics: *Acacia catechu*, *Terminalia chebula*, *Phyllanthus emblica*, *Curcuma longa*, *Semescarpum anacardium*, *Alstonia scholaris*, *Cassia fistula*, *Nerium odorum*, *Embelia ribes*, and *Jasminum grandiflorum*, *Pterocarpus santalinus*, *Nardostachys jatamansi*, *Cassia fistula*, *Pongamia glabra*, *Azadirachta indica*, *Holarrhena antidysenterica*, *Sinapis alba*, *Glycyrrhiza glabra*, *Berberis asiatica* and *cyperus rotundus* cure the skin diseases.

Counter-irritants: *Pterocarpus santalinus*, *Nardostachys Jatamansi*, *Cassia fistula*, *Pongamia glabra*, *Azadirachta indica*, *Holarrhena antidysenterica*, *Sinapis alba*, *Glycyrrhiza glabra*, *Berberis asiatica* and *cyperus rotundus* relieve pruritus (by dilating the superficial vessels).

Anthelmintics: *Moringa pterigosperma*, *Piper nigrum*, *Tithymalus antiquorum*, *Colocasia antiquorum*, *Vitex negundo*, *Embelia ribes*, *Achyranthes aspera*, *Tribulus terrestris*, *Clerodendron serratifolium* and *Salvadora persica* are vermifuge (cause the destruction or expulsion of the intestinal worms).

Antidotes: *Curcuma longa*, *Rubia cordifolia*, *Aerides tessallatum*, *Ichnocarpus frutescens*, *Pterocarpus santalinus*, *Strychnos potatorum*, *Albizzia, lebbek*, *Vitex negundo* and

Cordia myxa—these ten destroy (neutralize) poisons.

Galactogogues: *Andropogon muricatum*, *Oryza sativa*, a sub-species of *Oryza sativa*, *Saccharum officinarum*, *Saccharum cylindricum*, *Poa cynosuroides*, *Saccharum spontaneum*, *Tinospora cordifolia*, *Abelmoschus moschatus*, and *Hemionetis esculenta*—these ten increase milk.

Anti galactogogues: *Stephania hernandifolia*, *Zingiber officinale*, *Cedrus deodara*, *Cyperus rotundus*, *Saussurea zeylanica*, *Tinospora cordifolia*, *Holarrhena antidysenterica*, *Agathotes cherayta*, *Picrorrhiza kurroa*, and *hemidesmus*—these ten reduce the production of milk.

Aphrodisiacs: *Celtis orientalis*, *Vitis vinifera*, *Gymnema balsamicum*, *Gymnema lactiferum*, *Phaseolus trilobus*, *Tecoma labialis*, *Leptademia spartium*, *Asparagus racemosus*, *Nardostachys jatamansi* and *Rhus succedania*—these ten increase semen.

Anaphrodisiacs: *Saussurea auriculata*, *Fernia elephantum*, *Myrica sapida*, *os sapia*, *Nauclea cadamba*, *saccharum purificatum*, *Hygrophila spinosa*, *Ruellia longifolia*, *Sesbania grandiflora* and *andropogon muricatum*—these ten reduce semen (diminish sexual desire and power).

Adipogenous agents :—*Uvae passæ*, *Glycyrrhiza glabra*, *Tinospora cordifolia*, *Leptademia spartium*, *Convolvulus paniculata*, *Gymnema balsamicum*, *Gymnema lactiferum*, *Celtis orientalis*, *Caelogyne ovalis* and *Desmodium triflorum*—these ten cause the formation of fat (in the body.)

Diaphoretics :—*Moringa pterigosperma*, *Ricinus communis*, *Asclepias gigantea*, *Boerhaava diffusa*, *Boerhaava procubens*, *Horidium hexastichum*, *Sesamum indicum*, *Dolichos biflorus*, *Phaseolus trilobus*, and *Zizyphus jujuba*—these ten increase perspiration (by stimulating the sudoriparous glands).

Emetics :—*Mel*, *Glycyrrhiza glabra*, *Bauhinia variegata*, *Bauhinia acuminata*, *Nauclea cadamba*, *Calamus fasciculatus*, *Cephalandra indica*, *Crotalaria verrucosa*, *Asclepias gigantea* and *Achyranthus aspera*—these ten cause vomiting.

Purgatives :—*Uvae passæ*, *Gmelina arborea*, *Grewia asiatica*, *Terminalia chebula*, *Phyllanthus emblica*, *Terminalia belerica*, *Zizyphus laccifera*, *Zizyphus jujuba*, *Zizyphus napeca* and *Salvadora persica*—these ten are purgatives.

Enemata :—*Ipomœa turpethum*, *Aegle marmelos*, *Piper longum*, *Holarrhena antidysen-*

terica, Sinapis alba, Acorus calamus, fructi Holarrhena antidysenterica, Peucedanum graveolens, Glycyrrhiza glabra, and fructus Randia dumetorum—these ten are (suited) for enema.

Oily-enemata :—Vanda roxburghii, Cedrus deodara, Aegle marmelos, Randia dumetorum, Peucedanum graveolens, Boerhavia diffusa alba, Boerhavia diffusa rubra, Tribulus terrestris, Premna serratifolia and Oroxyllum indicum—these ten are (fitted) for oily-enemata.

Cerebral sedatives :—Cardiospermum halicabum, Sinapis nigra, Piper nigrum, Piper longum, Embelia ribes, Achyranthes aspera, Sinapis alba, Moringa pterigospermum, Clitorea ternatea, and Clitorea mariana—these ten are Cerebral sedatives (possibly an errhine is meant).

Anti-emetics :—Eugenia jambolana, Mangifera indica, Citrus medica, Zizyphus jujuba, Punicum granatum, Hordeum hexastichum, Andropogon muricatum, diatomaceous earth, and pop corn—these ten are anti-emetics (by allaying the irritability of the gastric nerves or the vomiting centers or neutralizing the toxins which irritate those centers).

Refrigerants :—Cyperus pertenuis, Alhagi maurorum, Cyperus rotundus, Oldenlandia herbacea, Pterocarpus santalinus, Agathotes chira-

yata, *Tinospora cordifolia*; *Pavonia odorata*, *corandrum sativum* and *Trichosanthes dioica*—these ten allay thirst.

Pulmonary sedatives : *Curcuma zerumbet* *Costus speciosus*, *Zizyphus jujuba*, *Solanum xanthocarpum*, *Solanum indicum*, *Cymbidium tessaloides*, *Terminalia chebula*, *Piper longum*, *Alhagi maurorum* and *Rhus succedania*—these ten relieve hiccup (by allaying irritability of the respiratory center or the terminal fibers of the nerves distributed to the bronchi and lungs).

Laxatives : *Aglaia roxburghiana*, *Hemidesmus indicus*, *fructus Mangifera indica*, *Colosanthus indicus*, *Symplocos racemosa*, *gummi Bombax malabaricum*, *Mimosa pudica*, *Grislea tomentosa*, *Clerodendrum indicum*, and *fructus Nymphaea lotus*—these ten cause the formation (evacuation) of feces.

Cholagogues :—*Eugenia jambolana*, *Boswellia serrata*, *Mucuna pruriens*, *Glycyrrhiza glabra*, *Bombax malabaricum*, *Pinus longifolia*, edible diatomaceous earth (containing oxide of iron which gives it a red-yellowish color), *Balata paniculatus*, *Nymphaea stellata*, and *fructus Sesamum indicum*—these ten give color to the feces (by causing the increased secretion of the bile).

Urinary diluents :—*Eugenia jambolana*, *Mangifera indica*, *Ficus infectoria*, *Ficus Benga- lensis*, *Spondias mangifera*, *Ficus glomerata*, *Ficus religiosa*, *Semecarpus anacardium*, *Oxalis acetosella* and *Acacia catechu*—these ten increase the quantity of urine.

Urinary-antacids or anticeptics :—*Nelumbian speciosum*, *Nymphæa stellata*, *Nymphæa alba*, *Nymphæa rubra*, *Nymphæa odorata*, *Nymphæa lotus*, *Nymphæa pubescens*, *Glycyrrhiza rubra*, *Aglaia roxburghiana* and *Grislea tomentosa*—these ten purify the urine.

Diuretics :—*Costus speciosum*, *Tribulus terrestris*, *Sesbania grandiflora*, *Cleome viscosa*, *Colcus amboinicus*, *Imperata cylindrica*, *Poa cynosuroides*, *Saccharum spontaneum*, *Panicum frumentaceum* and *Saccharum sara*—these ten increase the excretion of urine.

Pulmonary sedatives :—*Uvae passae*, *Terminalia chebula*, *Phyllanthus emblica*, *Piper longum*, *Alhagi maurorum*, *Rhus succedania*, *Solanum xanthocarpum*, *Boerhavia diffusa rubra*, *Boerhavia diffusa alba*, and *Phyllanthus nirury*—these ten relieve coughing (expectorants ?).

Respiratory stimulants :—*Curcuma zerumbet*, *Costus speciosum*, *Rumex vesicularis*, *Ellettaria cardiamomum*, *Ferula assafoetida*, *Ocimum*

sanctum, *Phyllanthus niruri*, *Cælogne ovalis*, and *Andropogon*—these ten relieve dyspnea.

Styptics :—*Stereospermum suaveolens*, *Premna serratifolia*, *Aegle marmelos*, *Colosanthus indica*, *Gmelina arborea*, *Solanum xanthocarpum*, *Solanum indicum*, *Desmosium trilobum*, *Uraria logopodioides*, and *Tribulus terrestris*—these ten reduce inflammation.

Antipyretics : *Hemidesmus indicus*, rock candy, *Stephania rotunda*, *Rubia cordifolia*, *Uvæ passæ*, *Salvadora persica*, *Grewia asiatica*, *Terminalia chebula*, *Phyllanthus emblica* and *Terminalia bellerica*—these ten relieve fever.

Spinal stimulants : *Uvæ passæ*, *Phoenix sylvestris*, *Buchanania latifolia*, *Zizyphus jujuba*, *Punica granatum*, *Ficus glomerata*, *Grewia asiatica*, *Saccharum officinarum*, *Hordeum hexastichum* and a variety of *Oryza sativa*—these ten remove fatigue.

Vascular sedatives : Pop corn, *Santalum album*, fructus *Gmelina arborea*, *Glycyrrhiza glabra*, rock-candy, *Nymphæa stellata*, *Andropogon muricatum*, *Hemidesmus indicum*, *Tinospora cordifolia* and *pavonia odorata*—these ten relieve 'æstus' (internal congestion), by moderating the cardiac excitement, and rendering the heart's action more slow or less forcible.

Vascular stimulants : *Cassia auriculata* (*Tabernaemontana coronaria* ?), *Aquilaria agallocha*, *Coriandrum sativum*, *Zingiber officinale*, *Carum ajowan*, *Acarus calamus*, *Solanum xanthocarpum*, *Paemna serratifolia*, *Colosanthus indica*, and *Piper longum*—these ten relieve the chilly sensation (by accelerating the circulation, acting on the heart and the blood-vessels).

Emollients : *Diospyros glutinosa*, *Buchanania latifolia*, *Zizyphus jujuba*, *Acacia catechu*, *Acacia bombolah*, *Alstonia scholaris*, *Shorea robusta*, *Terminalia arjuna*, *Terminalia tomentosa*, and *Acacia farmensiana*—these ten relieve (the burning sensation) of erysipelas.

Antirheumatics : *Desmodium trilobum*, *Uria logopodioides*, *Solanum indicum*, *Solanum xanthocarpum*, *Ricinus communis*, *Gymnema balsimicum*, *Santalanum album*, *Andropogon muricatum*, *Eleteria cardamamum*, and *Glycyrrhiza glabra*—these ten relieve rheumatic (gouty) pain (by dissolving uric acid deposits),

Counter-irritants : *Piper longum*, *radix Piper longum*, *Piper chaba*, *Plumbago zeylanica*, *Zingiber officianale*, *Piper nigrum*, *Pimpinella involucrata*, *Seseli ubanotis*, *Cuminum cyminum*, and *Achyranthes repens*—these ten relieve pain.

Styptics : Mel, Glycyrrhiza glabra, Crocus sativus, Bombax malabaricum, diatomaceous earth (containing oxide of iron), ferric calcium carbonate, Symplocos racemosa, Aglaia roxburghiana, rock candy, and pop corn—these ten arrest the flow of blood (by vascular contraction).

Anodynes :—Shorea robusta, Myrica sapida, Nauclea cadamba. radix Nymphaea lotus, Calophyllum, inophyllum, Bombax malabaricum, Albizzia lebbek, Calamus rotung, Feronia elephantum and Saraca indica—these ten relieve pain.

Anaesthetics : Ferula assafoetida, Melia azedarach, Acacia farnesiana, Acorus calamus, Andropogon acicularis, Herpestis monieria, Corydalis cava, Nardostachys jatamansi, Saraca indica, and Picrorrhiza kurroa—these ten abolish consciousness (by inhibiting the functions of the higher cerebral centers).

Aphrodisiacs : Citrullus colocynthis, Herpestis monieria, Panicum dactylon, Panicum frumentaceum, Steriospermum suaveolens, Terminalia chebula, Picrorrhiza kurroa, Sida cordifolia, and Aglaia roxburghiana—these ten increase the reproductive powers.

Analeptics : Tinospora cordifolia, Terminalia chebula, Phyllanthus emblica, Vanda roxbur-

ghii, Panicum dactylon, Caelogyne ovalis, Hemidesmus indica, Hydrocotyle asiatica, Desmodium trilobum, and Boerhaavia asiatica—these ten prolong life." *Charaka* I. 4. 12-62¹¹⁶.

186. जीवकर्षभक्तौ मेदा नंदा मेदा काकोली चौरकाकोली मुद्गमापपथ्यौ जीवक्षौ मधुकमिति दशेमानि जीवनीयानि भवन्ति ।

चौरिणी राजश्वर्षा बला काकोली चौरकाकोली वाक्यायनी भद्रीदनी भारवाजी पयस्पर्षगन्धा इति दशेमानि दृष्टनीयानि भवन्ति ।

मुसकुष्ठहरिद्रा दारुहरिद्रा वचातिविषा कटुरोहिणी चित्रक

चिरबिल्वहैमवत्य इति दशेमानि लेखनीयानि भवन्ति ।

सुवङ्गाकौरुवुकाग्रिमुखो चित्रा चित्रक चिरबिल्वशङ्खिनी

शकुलादनीस्वर्षा चौरिणी इति दशेमानि मेदनीयानि भवन्ति ।

मधुक मधुपर्णी पृथ्विपथ्यम्बुषकौ समङ्गा मोचरस धातकी

लोध्र प्रियङ्गु कटुफलानांति दशेमानि सन्धानीयानि भवन्ति ।

पिप्पलीपिप्पलीमूलचव्यचित्रकशृङ्गवेराक्षवेतस मरिचाजनीदा

भङ्गातकास्थि हिङ्गु निर्यासा इति दशेमानि दीपनीयानि भवन्ति ।

ऐन्द्राषभ्यतिरसस्य प्रोक्ता पयस्याश्वगन्धास्थिरा रोहिणी

बलातिबला इति दशेमानि वयानि भवन्ति ।

चन्दनतुङ्गपद्मकोशीर मधुकमस्त्रिष्ठासारिवापयस्या सितालता

इति दशेमानि वयानि भवन्ति ।

सारिवेक्षमूलमधुक पिप्पली द्राक्षाविदारौकैटथ्यहंसपादी-

हृत्ती कण्टकारिका इति दशेमानि कष्यानि भवन्ति ।

आम्बावातकनिकुचकरमह् हृत्वाक्काक्षवेतसकुबलवदरदाहिन-

मानुसुङ्गानांति दशेमानि ज्ञेयानि भवन्ति ।

1. *Pectorals* : “*Desmodium trilobum*, *Ba-
tatas paniculata*, *Sida cordifolia*, *Sida spinosa*,
Tribulus terrestris, *Uraria logopodiodes*, *Aspara-*

नागर चितकचव्यविङ्गमूल्याङ्गुलीचोवथामुक्त पिप्पली
पटोलानीति दशैमानि दशिम्लानि भवन्ति ।
कूटज विल चितक नागरातिविषाभया धन्वयासक-दाह-
हरिद्रा-वचाचव्यानाति दशैमानि चर्शाम्लानि भवन्ति ।
खदिराभयामलक हरिद्रावल्पर सप्तपर्णारगुध करवार-
विङ्गजातिप्रवाला इति दशैमानि कुष्ठम्लानि भवन्ति ।
चन्दननखदकृतमालनक्तमाल गिम्बकूटज सर्षपमधुकदाह-
हरिद्रामुक्तानीति दशैमानि कण्डम्लानि भवन्ति ।
अचीवमरीचगण्डोरकेवृक विङ्ग निगुण्डो-किण्वाङ्गुली-
वृषपर्णिकाखुपर्णिका इति दशैमानि क्षिप्रिम्लानि भवन्ति ।
हरिद्रामञ्जिष्ठासुवह्नासूक्ष्मापाणिन्दीचन्दन कतक शिरीष
सिन्धुवार-श्लेष्मातका इति दशैमानि विषम्लानि भवन्ति ।
वीरण-शालीषटिकेचुवालिका दभङ्गुश-काशगन्धर्कट
कर्तृणमूलातीति दशैमानि स्नानजननानि भवन्ति ।
पाठामहौषध सुरदारुसुसूय्या गुडूचोवत्तक-फलकिराततिक्त-
कटुरोहिणीसारिवा इति दशैमानि स्नानशोधनानि भवन्ति ।
जीवकर्षभककाकोलीचौरकाकोलीमुद्गपर्णी माषपर्णीमेदाहच-
रुद्राजटिलाकुलीङ्गा इति दशैमानि युक्त-जननानि भवन्ति ।
कुष्ठैलवालुककटु-फलसमुद्रफेण कदम्बनिथ्यासिन्धुकाण्डेचु-
चुरकवसुकोशीराणीति दशैमानि युक्तशोधनानि भवन्ति ।
वृषीकामधुकमधुपर्णीमेदाविदारौ काकोलीचौर-काकोली
जीवकजीवन्ती-शालपर्णी इति दशैमानि स्नेहोपनानि भवन्ति ।

gus racemosus, Ichnocarpus frutescens, Hemidismus indicus nigra, Oeltis orientalis minor,

श्रीभाञ्जनकौरस्थार्कश्रीर पुनर्नवायवतिलकुलत्वमावद-

राशीति दशेमानि स्वेदोपगानि भवन्ति ।

मधुमधुक कोविदार कर्कशु दारकनीप-विदुलविन्वीश्वपुष्पी-

सदापुष्पी प्रत्यक्षपुष्पा इति दशेमानि वननीपगानि भवन्ति ।

द्राक्षाकाश्मर्य परवकाभयामलक-विभीतक कुबलवदर-

कर्कण्डुपीलुनीति दशेमानि विरेचनीपगानि भवन्ति ।

विहहिल पिप्पली कुष्ठ सर्षपवचा बल्लकफल शतपुष्पा-

मधुकमदनफलानीति दशेमान्वास्यापनीपगानि भवन्ति ।

राक्षासुरदाहविलमदन शतपुष्पा-इक्षोरपुनर्नवा चर्दट्टा-

धिमग्व श्लोमाका इति दशेमान्शुवासनीपगानि भवन्ति ।

ज्योतिषतीक्ष्णक मरिचपिप्पलीविडङ्ग शिबु सर्षपापामार्गतक्षु-क-

श्रेता महाश्रेता इति दशेमानि शिरोविरेचनीपगानि भवन्ति ।

जम्बाक्षपल्लवमातुलुङ्गाक्षवदरदाहिनयव दण्टिकीश्रीर-

स्रक्ताजा इति दशेमानि हर्हि नियहृणानि भवन्ति ।

नागरधन्व यासकमुक्षपपटक-चन्दनकिराततिलकगुच्छीक्रीवर

धाम्यक पटोलानीति दशेमानि वृक्षा-नियहृणानि भवन्ति ।

शटीपुष्करमूलवदरबोज कण्टकारिका इक्षुतीक्ष्णवृद्धाभयापिप्पली-

दुरालभाकुलीरश्म्य इति दशेमानि हिमनियहृणानि भवन्ति ।

प्रियङ्गु नन्ताभास्य कटुङ्ग-लोभ नीचरस समज्ञा घातकीपुष्प

पक्षा पञ्चकेशरानीति दशेमानि पुरीषसंहर्षणीयानि भवन्ति ।

जम्बुशक्तीलक कच्छुरा मधुक शाखली श्रीवैटक भृष्ट

क्षप्यस्त्रोत्पलितलका इति दशेमानि पुरीष-

विरजनीयानि भवन्ति ।

Vitis vinifera, *Teramnus labialis*, *Phaseolus trilobus*, *Solanum indicum*, *Solanum xanthocarpum*, *Boerhaavia diffusa*, *Ricinus communis*,

जम्बायश्च बट कपीतनोदुम्बरान्न-भस्मातकाश्मस्तकसोम

वत्का इति दशे मानि सूत्रसंयज्ञाणि भवन्ति ।

पद्मोत्पल नलिनकुमुदसीगन्धिका पुष्करीक शतपत्रमधुक-

मिषङ्कुधातकीपुष्पाक्षीति दशे मानि सूत्रविरजनीयानि भवन्ति ।

हृष्यादनीचदंष्ट्रावसुक्कवशिर पाषाणमेद दभंजुशकाश्चगुग्गे तु

कटभूलाणीति दशेमानि सूत्रविरचनीयानि भवन्ति ।

द्राक्षाभयामलक-पिप्पलीदुरासभा शङ्खीकण्टकारिका हृषीर

पुनर्नवा तामलक्य इति दशेमानि चासहराणि भवन्ति ।

शङ्खी पुष्करभूलाकवेतसेवाङ्गिङ्गुब सुरका तामलकी

जोबनी चक्षा इति दशेमानि चासहराणि भवन्ति ।

पाटलाप्रिमन्थ विलम्बीचाक-काश्मर्यकण्टकारिका हृषीर शालपर्णी

पृश्निपर्णी-नीचुरका इति दशेमानि शीथहराणि भवन्ति ।

शारिवाक्यकर्ण पाठा मल्लिहा द्राक्षा पं.सु पद्मकाभया-

मलकविभीतकानीति दशेमानि ज्वरहराणि भवन्ति ।

द्राक्षाखर्जूर पिप्पल बदर दाक्षिण फला पुष्करकीचुयव-

यष्टिका इति दशेमानि ग्रन्थहराणि भवन्ति ।

लाजाचन्दनकाश्मर्यफलमधुक शर्करा नीलोत्पलोक्षीर शारिवा

गुक्षूचीश्रीवेराक्षीति दशेमानि दाहप्रशमनानि भवन्ति ।

तनरागुब-धान्यक-शङ्खवेरभूतकवचा कण्टकारिकाप्रिमन्थ

शीलाकपिप्पल्य इति दशेमानि शीतप्रशमनानि भवन्ति ।

तिन्दुकपिप्पल्यकदर खदिरकदर सप्तपर्णाचकार्पाङ्गुनासना-

रिनिहा इति दशेमान्युद्ध' प्रशमनानि भवन्ति ।

Clitoræ ternata, Tragia involucrata, and Mucuna (Carpopogon) pruriens. These are called 'vidāri' and they relieve the derangements of 'vāyu' and 'pitta', consumption, tubercles, gouty pains, dyspnea and other bronchial troubles.

II. *Antiseptics* : Cassia fistula, Randia dumentorum, Flacourtia ramontchi, Holarrhena antidysenterica, Stephania capilata, Acacia catechu, Stereospermum suaveolens, Sansevieria zeylanica, Holarrhena antidysenterica, Alstonia scholaris, Azadirachta indica, Barleria prionitis, Barleria buxifolia, Tinospora cordifolia, Plum-

विदारिगन्धाः पृथिव्येषु हि लो कष्टकारिकैरश्वकाकोलीचन्द-
 नोशीरैस्त्रिषु कानीति दशेभ्यः प्रशमनानि भवन्ति ।
 पिप्पली पिप्पलीमूल चव्य-चित्तक शङ्खवेर मरिचाजमोदाज-
 गन्धाज्जो गण्डीराणीति दशेभ्यः प्रशमनानि भवन्ति ।
 मधुमधुकवचिर मोचरस मत्तपाललोध्रगैरिक प्रियङ्गु-
 शर्करालाजा इति दशेभ्यः शोषितस्थापनानि भवन्ति ।
 शाल कटफल कदम्बपत्रक तुल्ल मोचरस शिरीषवज्जु लोखव-
 काशोका इति दशेभ्यः वेदनास्थापनानि भवन्ति ।
 हिङ्गु कैटय्यारिमेदा वचा चोरक वयःस्थानोलोमी वटिलाप-
 लङ्घाशोकोद्दिग्ध इति दशेभ्यः संज्ञास्थापनानि भवन्ति ।
 ऐन्द्रीत्राघ्नीशतकीर्यासङ्खबीर्यामीचाम्यथा शिवारिष्टा वायुपुण्ड-
 विवक्ष्सेनकान्ता इति दशेभ्यः प्रज्ञास्थापनानि भवन्ति ।
 चव्यताभया धात्री मुक्तात्रेण जीवन्त्यतिरसा मण्डुकपर्णी-
 स्थिरा पुनर्नवा इति दशेभ्यः वयःस्थापनानि भवन्ति ।

bago zeylanica, *Pongamia glabra*, *Oarissa caranda*, *Trichosanthes dioica*, *Ophelia chirayta*, and *Momordica charantia* are called '*āragdhādī*', and they are disinfectants in catarrh, toxemia, gonorrhea, skin disease, and abscess-cavities and relieve fever, vomiting and pruritus (as symptomatic expressions of the former lesions).

III. *Hæmatinics* : *Cratæva religiosa* ; *Barleria cærulea*, *Morunga plerygosperma*, *Hyperanthera morunga*, *Seshania aculeata*, *Gymnema sylvestris*, *Guilandina bonducella*, *Pongamia glabra*, *Sansevieria zeylanica*, *Premna serratifolia*, *Barleria cristata*, *Momordica monadelpha*, *Coccinea indica*, *Calotropis gigantea*, *Pothos officinalis*, *Plumbago zeylanica*, *Asparagus racemosus*, *Aegle marmelos*, *Gymnema sylvestris*, *Imperata cylindrica*, *Solanum indicum* and *Solanum xanthocarpum* are called '*varuṇādī*', and they relieve (the derangements of) '*kapha*' and adiposis, headache, adenoncosis and adenitis.

IV. *Lithontriptics* : *Pentaptera arjuna*, *Barleria cærulea*, *Barleria cristata*, *Imperata cylindrica*, *Vanda roxburghii*, *Cyperus pertinens*, *Arundo indica latifolia*, *Poa cynosuroides*, *Saccharum spontaneum*, *Coleus aromaticum*, *Premna serratifolia*, *Sansevieria zeylanica*,

Calotropis gigantea, *Scindapsus officinalis*, *Calosanthos indica*, *Barleria prionitis*, *Nymphaea stellata*, *Herpestis monieria*, and *Tribulus terrestris* are called '*vīratarvvādi*' and they relieve stranguary, gravel and urinary calculus.

V. *Oxidizer* : *Resina Shorea robusta*, *Terminalia alata tomentosa*, *Acacia catechu*, *Acacia arabica*, *Diospyros embryosteris*, *Areca catechu*, *Betulabhojapatra*, *Gymnema sylvestris*, *Ougenia dalbergisides*, *Santalum album*, *Pterocarpus santalinus*, *Dalbergia sissoo*, *Albizzia lebbek*, *Terminalia tomentosa*, *Anogeissus latifolia*, *Terminalia arjuna*, *Borassus flabelliformis*, *Tectona grandis*, *Pongamia glabra*, *Guilandina bonducella*, *Shorea robusta*, *Aquilaria agallocha*, and *Santalaum xanthocarpum* are called '*sāla-sārādi*', and these relieve phlegma, ediposis, and skin-diseases, gonorrhea and anemia.

VI. *Astringent disinfectants* : *Symplocos racemosa*, *Symplocos alstonia*, *Butea frondosa*, *Calosanthos indica*, *Clerodendron siphonanthus*, *Myrica sapida*, *Myrica rubra*, *Boswellia serrata*, *Rubia cordifolia*, *Shorea robusta* and *Musa sapientum* are called '*rodhrādi*', and they relieve phlegmatic disposition and adiposis, and vaginal diseases, arrest diarrhoea, disinfect abscess cavity and neutralize toxins.

VII. *Disinfectants* : Calotropis gigantea, Calotropis gigantea alba, Pongamia glabra, Guilandenia bonducella, Heliotropium indicum, Achyranthes aspera, Clerodendrum, (siphonanthus, Vandra roxburghii, Gloriosa superba, Batatas paniculata Batatas epulis, Tragia involucrata, rock salt, Balanites roxburghii are called '*arkādi*' and they relieve phlegmatic disposition, adiposis, intestina, worms, skin diseases, neutralize toxins and disinfect abscess cavity.

VIII. *Pectorals* :—Ocimum sanctum, Ocimum hirsutum, Ocimum frutescens, Andropogon shoenanthus, Andropogon martiny, Andropogon muricatum, Andropogon iwaraneusa, Cassia esculenta, Achyranthes aspera ; Hygrophylla spinosa, Eriabelia ribes, Myrica sapida, surasi, Vitez negundo, Celsia caromandeliana, Salvinia cucullata, Clerodendron siphonanthus, Ruta graveolens, Solanum nigrum and Strychnos nuxvomica are called '*surasādi*' and they relieve phlegmatic disposition, bacterial flora, catarrh, anorexia, dyspnea and cough and disinfect abscess cavity.

IX. *Lithontriptics* :—Bignonia indica, Butea frondosa, Grisea tomentosa, Plumbago zeylanica, Bandia dumetorum, Dalbergia sissoo, Euphorbia

neriifolia, Terminalia, chebula, Terminalia belerica and Phyllanthus embelica are called '*muskādi*' and they relieve adiposis, urethral diseases, gonorrhea, chancre, anemia (symptomatic of the other lesions), gravel and urinary calculus.

X. *Stomachics*: Piper longum, radix Piper longum, Piper chaba, Plumbago zeylanica, Zingiber officinale, Piper nigrum, Scindapsus officinales, Piper auranticum, Elettaria cardamomum, Pimpinella involucrata, fructus Holarrhena antidysenterica, Stephania hernandifolia, Cuminum Cyminum, Sinapis alba, fructus Melia azadarach, Ferula assafoetida, Clerodendron siphonanthus, Sansevieria zeylanica, Aconitum heterophyllum, Acorus calamus, Embelia ribes and Picrorrhiza kurroa are called '*pippalyādi*' and they are appetizing, stomachic and dessicant, and they relieve catarrh, flatulence, anorexia, glandular swelling and pain.

XI. *Carminatives*: Elettaria cardamomum, Tabernaemontana coronaria, Saussurea auraticulata, Nardostachys jatamansi, Andropogon schoenanthus, Cinnamomum zeylanicum, Cinnamomum tamala, Mesua ferrea, Agraia roxburgiana, Piper aurantiacum, operculum of Purpura. Tamirindus indica, (*sukti* = pearl-oyster), '*sthauṇeyaka*' (a yellowish fragrant plant), Canscora

decussata, Pinus longifolia, Cinnamomum pauciflorum, Andropogon acicularis, Sida cordifolia, Balsamodendron mukula, Shorea robusta, Liquidambar orientalis, Boswellia seratta, Aquilaria agallocha, Trigonella corniculata, Andropogon muricatum, Cedrus deodara, Crocus sativus, and Calophyllum inophyllum are called '*elādi*' and they relieve flatulence, phlegmatic disposition, pruritus and urticaria.

XII-XIII. *Stomachics*: Acorus calamus, Cyperus rotundus, Aconitum heterophyllum Terminalia chebula, Cedrus deodara, Mesua ferrea, Curcuma longa, Berberis asiatica, Uraria logopodioides, Holarrhena antidysenterica, and Glycyrrhiza glabra are called *vachādi* and *hari-drādi* and they are galactagogue, antidysenteric and particularly stomachic.

XIV. *Laxatives*: Hemidesmus indicus, Ichnocarpus-frutescens, Ipomœa turpethum, Baliospermum montanum, Canscora decussata, Symplocos racemosa, Mallotus philippenensis, Trichosanthes dioica, Areca catechu, Salvinia cucullata, Citrullus colocynthis, Cassia fistula, Pongamia glabra, Guilandina bonducella, Tinospora cordifolia, Stereospermum suaveolens, Argyreia speciosa, Euphoria neriifolia and Cleome felina are called *syāmādi* and they relieve tympanites and ascites.

XV. *Diuretics* : *Solanum indicum*, *Solanum xanthocarpum*, *Holarrhena antidysenterica*, *Stephania hernandifolia*, and *Glycyrrhiza glabra* are called '*vr̥hatyādi*' and they relieve the excess of the humors, anorexia, eructation and strangury.

XVI. *Disinfectants* : *Trichosanthes dioica*, *Santalum album*, *Pterocarpus santalinus*, *Sansevieria zeylanica*, *Tinospora cordifolia*, *Stephania hernandifolia*, and *Picrorrhiza curroa* are called *paṭalādi* and they are beneficial in anorexia, fever, pruritus, and particularly in the asepsis of the abscesses.

XVII. *Analeptics* : *Gymnema balsamicum*, *Gymnema lactiferum*, *Celtis orientalis*, *Vitis vinifera*, *Phaseolus trilobus*, *Teramnus labialis*, *Leptadenia spartinum*, *Leptadenia reticulata*, *Tinospora cordifolia*, *Rhus succedama*, *manna Bambucæ*, *Prunus padus* (?), *Nymphæa lotus*, *Nymphæa odorata*, *Nymphæa pubescens*, *Mimusops kauki* and *Glycyrrhiza glabra* are restorative, stimulant, tonic galactagogue and phlegmatic.

XVIII. *Lithontriptics* : Alkalies, rock salt, Bitumen, iron sulphide, *Assafœtida* and copper sulphide are called *uṣakādi* and they relieve phlegmatic disposition and adiposis, and urinary calculus, gravel and strangury.

XIX. Vascular Sedatives : *Ichnocarpus frutescens*, *Glycyrrhiza glabra*, *Santalum album*, *Pterocarpus santalinus*, *Prunus padus*, *Gmelina arborea*, *Bassia latifolia*, and *Andropogon muricatum* are called *sārivādi* and they relieve polydipsia, hemorrhage, bilious fever and especially hyperemia.

XX. Hemostatics : Sulphate of antimony, incinerated antimony, *Mesua ferrea*, *Aglaia roxburghiana*, *Nymphaea stellata*, *Andropogon muricatum* radix, *Nelumbium speciosum*, and *Glycyrrhiza glabra* are called *añjanādi* and they relieve hemorrhage, toxemia and internal congestion.

XXI. Carminatives : *Grewia asiatica*, *Uvae passae*, *Myrica sapida*, *Punica granatum*, *Mimusops indica*, *Strychnos potatorum*, *Tectonia grandis*, *Terminalia chebula*, *Terminalia belerica*, and *Phyllanthus emblica* are called *paruṣkādi* and they relieve flatulence, urinary troubles, polydipsia, and are appetizing and cardiac stimulants.

XXII. Antiseptics : *Aglaia roxburghiana*, *Mimosa pudica*, *Woodfordia floribunda*, *Calophyllum inophyllum*, *Pterocarpus santalinus*, *Cæsalpinia sappan*, *Bombax malabaricum*, antimony sulphide, diatomaceous mixture of antimony (?), *Nelumbium speciosum*, *Rubia*

cordifolia, and *Ichnocarpus frutescens* are called '*priyāṅgvādi*' and they are beneficial in ulcerative dysentery, for rejoining the fractured bones and as pustulants for the tumors.

XXIII. *Pustulants* : *Stephania hernandifolia*, *Woodfordia floribunda*, *Mimosa pudica*, *Calosanthus indica*, *Glycyrrhiza glabra*, *Aegle marmelos*, *Symplocos racemosa*, *Symplocos alstonia*, *Buta frondosa*, *Nerium coronarium*, and *Nelumbium speciosum* are called *ambasṭhādi* and they are pustulant, and are beneficial in fractured bones.

XXIV. *Pustulants* : *Ficus bengalensis*, *Ficus gloremata*, *Ficus religiosa*, *Ficus infectoria*, *Bassia latifolia*, *Spondias mangifera*, *Terminalia arjuna*, *Mangifera indica*, *Mangifera sylvatica*, *Andropogon acicularis*, *Cinnamomum tamala*, *Eugenia corymbosa*, *Buchanania latifolia*, *Glycyrrhiza glabra*, *Picrorrhiza kurroa*, *Mimusops elengi*, *Nauclea cadamba*, *Zizyphus jujuba*, *Diospyros embryosterus*, *Boswellia serrata*, *Symplocos racemosa*, *Symplocos alstonia*, *Semicarpus anacardium*, *Butea frondosa*, and *Cedrela toona* are called '*nyagrodhādi*' and they are pustulants and beneficial in the reunion of the fractured bones and are vaginal disinfectants.

XXV. *Antipyretics* : *Tinospora cordifolia*,

Azadirachta indica, *Coriandrum sativum*, *Santalum album* and *Prunus padus* are called '*guduchyadi*' and they are febrifuge, stomachic and relieve eructation, anorexia, polydipsia and hyperemia.

XXVI. *Refrigerants*: *Nymphaea stellata*, *Nymphaea rubra*, *Nymphaea alba*, *Nymphaea odorata*, *Nymphaea caerulea*, *Nelumbium speciosum* and *Glycyrrhiza glabra* are called '*utpaladi*' and are refrigerant, antitoxic, hematinic, antiemetic, and relieve heart diseases and epilepsy.

XXVII. *Oxidizers*: *Cyperus rotundus*, *Curcuma longa*, *Terminalia chebula*, *Phyllanthus emblica*, *Terminalia belerica*, *Saussurea auriculata*, *Acorus calamus*, *Stephania hermanifolia*, *Picrorrhiza kurroa*, *Pongamia glabra*, *Aconitum heterophyllum*, *Elettaria cardamomum*, *Semicarpus anacardium* and *Plumbago zeylanica* are called '*mustadi*' and they are oxidizing agents (reducing phlegma) stimulating digestion, increasing the secretion of milk (in woman) and act as disinfectants in vaginal diseases.

XXVIII. *Astringent antiseptics*: *Terminalia chebula*, *Terminalia belerica*, and *Phyllanthus emblica* are known as *triphalā* and they are beneficial in gonorrhea, skin-diseases, in some eye-troubles and they are stomachic.

XXIX. *Stomachics* : Piper longum, Piper nigrum and Zingiber zerumbet are called *trikaṭu* and they are oxidizing agents and are beneficial in phlegmatic disposition, adiposis, diabetes, skin-diseases, glandular swelling, and anorexia.

XXX. *Stomachics* : Phyllanthus emblica, Terminalia chebula, Piper longum and Plumbago zeylancia are called *āmalakyādi* and they are tonic, stimulating, febrifuge and beneficial to the eyes.

XXXI. *Metallic salts* : Tin, lead, silver, iron and gold (salts), and iron-oxide are called *trapādi* and they are bacteri-cidal, antitoxic and beneficial in anemia and gonorrhea. (*Tin* compounds are no more used in modern medicine except as filings though in former times stannum oxidatum and butyrum stanni, were popular. *Lead* oxide, unguentum plumbi iodidi, and various other salts and preparations of lead are in use, usually for external application. *Copper* likewise has various external therapeutic uses. The oleate of copper is an admirable astringent, antiseptic and anti-parasitic preparation, especially valuable in various forms of tinea trichophytosis ; copper sulphate in solid stick is effectively used as a superficial caustic in indolent ulcers, exuberant granulations, and in syphilitic and other sores in the mouth

and the throat. *Silver nitrate* in weak solutions has been used externally as an astringent caustic and internally in nervous disorders with marked benefit. But as it leaves a dark stain on the skin, *argentum Crede* is preferred by many, as the lactate and citrate of silver is claimed to possess the power of penetrating the entire organism and effecting a general disinfection of the entire organism. Argonin, an organic combination of silver with casein, soluble in water, but non-irritant, has been lately introduced in the market and is claimed to be antidotal to the gonococcus. Argyrol, another non-irritant combination, is used in 2 p. c. solution in gonorrheal eye-diseases. Various *iron preparations* are still in vogue and administered internally to supply iron to hemoglobin in its deficiency as in anemia. *Gold* and sodium chloride has marked bactericidal powers, resembling mercuric chloride and internally in very small doses it acts upon the glandular structures of the stomach and the liver, stimulating nutrition and assimilation; but in larger doses it produces violent gastroenteritis without salivation or ulceration).

XXXII. *Antiparasitics* : Lac, Cassia fistula, Holarrhena antidysenterica, Nerium odorum, Myrica sapida, Curcuma longa, Berberis asiatica,

Azardirachta indica, *Alstonia scholaris*, *Jasminum grandiflorum* and *Ficus heterophylla* are called 'lākṣādi' and they are of astringent, bitterish sweetish taste and are antiparasitical.

XXXIII. *Tonics* : The roots of *Trilobus terrestris*, *Solanum indica*, *Solanum xanthocarpum*, *Uraria logopodioides*, *Desmodium trilobus*, are known as 'pañcha-mūla' and they are of astringent sweet-bitterish taste and are restorative tonics.

XXXIV. *Stomachics* : The roots of *Aegle marmelos*, *Premna serratifolia*, *Calosanthus indica*, *Stereospermum suaveolens* and *Gmelina arborea* are called large 'pañcha-mūla' and they are stomachics of slightly bitter-sweetish taste.

XXXV. *Oxidizers* : The five small roots and the five large roots, are called together 'daśa-mūla' and they are stomachic and febrifuge.

XXXVI. *Antiseptics* : The roots of *Batatas paniculata*, *Ichnocarpus frutescens*, *Curcuma longa*, *Tinospora cordifolia*, and *Gymnema sylbestre* are called 'valli-pañchamūla'. The roots of *Carissa carandas*, *Tribulus terrestris*, *Barleria cristata*, *Asparagus racemosus* and *Hygrophila spinosa* are called 'kaṇṭaka pañchamūla'. These two 'pañchamūlas' relieve inflammation and gonorrhea.

XXXVII. *Diuretics* : The roots of *Poa cynosuroides*, *Saccharum spontaneum*, *Phragmites communis*, *Imperata cylindrica* and *Saccharum officinarum* are called '*tr̥ṇa pañcha-mūla*' and if given with milk, they are diuretic and cure urinary troubles." *Suśruta* I. 38. 2-36¹⁰⁷.

187. समासेन समन्विशद्भ्यगणा भवन्ति । तद्यथा—विदारिगन्धा विदारौ सङ्गदेवा विशदेवा श्वदंष्ट्रा पृथक्पर्णी शतावरी सारिवा कृष्णसारिवा जीवकर्षभकी महासङ्गा सुद्रसङ्गा हृत्पत्नी पुनर्वैरक्षी रंसपादी हृत्किष्काष्टपभी चेति ।

विदारिगन्धादिरयं गणः पित्तानिलापहः ।

शोषगुष्माङ्गमर्द्दोद्द-वासकासविनाशनः ॥ २

आरवधमदनगोपधीश्टाकश्टकौकुटजपाठापाटलाभूष्व-न्द्रयव-सप्तपर्ण-निम्ब-कुशश्टकदासीकुशश्टक-गुडूचीचितकशाङ्ग-ष्टाकरस्रहयपटोलकिराततित्तकानि सुपवी चेति ॥

आरगुधादिरित्येष गणः श्लेष्मविषापहः ।

मेरुकुष्ठज्वरवमी-कण्डूघ्नो ब्रणशोधनः ॥ ३

वरुणार्सगर्लाशियु मधुशियु तर्कारीमेघशङ्गीपूतिकनक्तमालमोरटाप्रिमन्थसैरीयकवय-विन्वीवसुकवसिर-चितकशतावरी-विलाजशङ्गीदर्भा हृत्पत्नीययश्चेति ।

वरुणादिर्गणो श्लेष्म कफमेदोनिवारणः ।

विनिहन्ति शिरःशूलं गुल्माभ्यन्तरविद्रधीन् ॥ ४

धौरतकसङ्गवयदध- हृत्पादनीगुन्द्रानलकुशकाशाशमेदकाग्रिमन्थमोरटावसुक-वसिरभल्ल ककुशश्टकेन्द्रीवरकपोतवङ्गाः श्वदंष्ट्रा चेति ।

धौरतवर्षादिरित्येष गणो वातविकारगुत् ।

अशरीशर्काभूतकृष्णाघातारुजापहः ५

सालसारजकर्षणद्विकदरकालक्तन्धकमुकभूर्जमेघशङ्गीतिनिशचन्दनकुचन्दनशिश-पाशरीषासनधवाङ्गुनताक्षशाकनक्तमालपूतिकाश्वकर्णागुदणि कालीयकश्चेति ।

Emetics : "Randia dumetorum, Wrightia antidysenterica, Andropogon serrata, Citrullus

सालसारादिरित्येष गणः कुष्ठविनाशनः ।

मेघपाष्णामयहरः कफमेदोविशोधनः ॥ ६

रोध्रसाररोध्र, पलायकुटप्रटाशोफफञ्जीकटफलैलवायुकसन्नकीजिन्निगीकदन्ध-
साक्षाः कदली चेति ।

एष रोध्रादिरित्युक्ती मेदःकफहरौ गणः ।

योनियोषहरः सन्धौ प्रण्यौ विषविनाशनः ॥ ७

अर्काजर्क-करञ्जवय-नागदन्तोमयूरक - भार्गीराखेन्द्रपुष्पीचुद्रचेतामहाचेतावृषि-
काख्यलवणाक्षपसहचरेति ।

अर्कादिकौ गणौ ह्येष कफमेदोविषापहः ।

क्रिमिकुष्ठप्रशमनौ विशेषाद् व्रणशोधनः ॥ ८

सुरसाचेतसुरसाफिज्जम्भाज्ज कभूसृणसुगन्धकमुसुखकालमालकासमर्द्धचवकखर-
पुष्पाविडङ्गकटफलसुरसोनिर्गुच्छीकुलाहलीन्दुबक्राणि काफञ्जीप्राचीवलकाकमाथ्यो विष-
मुष्टिकचेति ।

सुरसादिर्गणौ ह्येष कफहृत् क्रिमिसूदनः ।

प्रतिश्यायावृचिन्नासकाक्षौ व्रणशोधनः ॥ ९

मुष्णक-पल्लः-धव-चिमक-मदनवृचक-शिंशपावज्जह्वास्त्रिफला चेति :

हृ-अर्कादिर्गणौ ह्येष मेदोघ्नः शुक्रदोषहृत् ।

मेढ्राशःपाण्डुरोगघ्नः शर्कराशमरीनाशनः ॥ १०

पिप्पलीपिप्पलीमूलचव्यचिमकशृङ्गवेरमरिचहृत्सिपि (लोहरेणुकीलाजनीदेन्द्रयव-
पाठावीरकसर्षपमहागिन्ध-फल-हिरण्मृभागैर्मधुरसातिविषावपाविडङ्गानि कटु रोहिणी-
चेति ।

पिप्पल्यादिः कफहरः प्रतिश्यायानिलाक्षणीः ।

निङ्गमाक्षीपनी गुण-शूलज्वरामपाचनः ॥ ११

colocynthis, Luffa pentandra, Luffa amara, Sinapis alba, Embelia ribes, Piper longum,

एलातगरकुडनांसीध्यामकत्वक्पत्रनागपुष्प-प्रियङ्गु हरिणकाभ्यान्नख-शुक्तिचण्डी-
खेयकश्रीवेष्टकचोचचोरकवालक-गुग्गुल-सर्ज्वरसतुक्ककन्दुकाऽगुडस्पृष्टीशोरमद्रदाह-
कुडुमाचि पुन्नागकेशरश्चेति ।

एलादिको वातकफौ निहन्त्यादिधमेव च ।

वर्षप्रसादनः कण्डू-पिङ्गकाकांठनाशनः ॥ १२

वचामुसातिविषाभयामद्रदाहणि नागकेशरश्चेति । हरिद्रादाहहरिद्राकलश्रीकूटज-
बीजानि मधुकश्चेति ।

एतौ वचाहरिद्रादौ गणौ क्षन्विशोधनी ।

श्यामातीसारशमनौ विशंशाहोषपाचनौ ॥ १३

श्यामामहाश्यामादिवहन्तोश्छिन्नो-तिक्तककम्पितक-रम्यककमुकपुत्रश्चौ-जवाची-
राजवृक्ष-करञ्जद्वय-गुडूची-सप्तलाष्टगलान्नीमुधाः सुवर्णचोरो चेति ।

उक्तः श्यामादिरित्येष गणौ गुणविशेषतः ।

श्यामाहोदरविड्भेदी तथोदःवर्तनाशनः ॥ १४

हृत्तीक्ष्णकारिकाकुटजफणपाठा मधुकश्चेति ।

पाचनयो हृत्त्यादिर्गणः पित्तानिलापहः ।

कफारोचकहृत्तासमूहकृत्रिणाशनः ॥ १५

पटोलचन्दनकुचन्दनमूर्त्वागुडूचीपाठाः कटरोहिणी चेति ।

पटोलादिर्गणः पित्त-कफारोचकनाशनः ।

ज्वरोपशमनौ प्रप्यम्बुहिं कण्डू विषापहः ॥ १६

काकोलीचोरकाकोलीजीवकवर्भकमुद्गपर्णौ-मावपर्णौमिदामहामिदा-खिल्लवृद्धा-कर्कट-
मृङ्गी-मुनाचोरी-पद्मक-प्रपौष्टरोकहिं-हृत्ति-मृष्टीकाजीवन्यौ मधुकश्चेति ।

काकोल्यादिरयं पित्त-शोषितानिलाशनः ।

जीवनी मृङ्गचो हृत्तः क्षन्वन्नेत्रकरस्तथा ॥ १७

Pongamia glabra, Cassia tora, Bauhinia varie-
gata, Cordia myxa, Melia azadrachta, Withania

ऊषकसैम्बशिलाजतुकासौसदयङ्गिनि तुल्यकश्चेति ।

ऊषकादिः कफं हन्ति, गणो मीदोविशेषणः ।

अश्वरीशर्करामूत्र-रक्तगुणप्रणाशनः ॥ १८

सारिवामधुकचन्दनकुचन्दनपद्मकाशमीरफल-मधुकपुष्पाण्युशीरश्चेति ।

सारिवादिः पिपासाम्नो रक्तपित्तहरो गणः ।

पित्तज्वरप्रशमनो विशेषाद्वाङ्मनाशनः ॥ १९

अञ्जनरसाञ्जननागपुष्प-प्रियङ्गुनीलोत्पलनलदमलिनकीशराशि मधुकश्चेति ।

अञ्जनादिर्गणो ह्येष रक्तपित्तनिर्वहणः ।

विषोपशमनो दाहं निहन्त्याभ्यन्तरं तथा ॥ २०

पद्मक-द्राक्षा-कटफल-दाङ्गिम-राजादनकतकफल-शाकफलानि विफला चेति ।

पद्मकादिरित्येष गणोऽनिलविनाशनः ।

मूत्रदोषहरो ह्ययः पिपासाम्नो कश्चिप्रदः ॥ २१

प्रियङ्गुसमङ्गाधातकीनागपुष्पचन्दनकुचन्दनमीचरसरसाञ्जन-कुम्भीकसोतोऽञ्जनपत्र -
केशरयोजनवल्ग्वो दीर्घमूला चेति ।

अम्पठाधातकीकुसुमसमङ्गाकटङ्गमधुकविलपेशिकारोप्रसावररोप्रपलाशनन्दीहचपत्र -
केशराणि चेति ।

गणो प्रियङ्गुश्वहादी पक्तातीसारनाशनौ ।

सन्धानोयो द्विती पित्ते व्रणानाद्यापि रोपणी ॥ २२

व्यथोद्युम्बराश्वत्थमधुक-कपोतनककुभावकोशवचोरक्तपत्रजम्बडयपियालमधक-
रीङ्गिणीवज्रलकदम्बवदरोतिन्दुकोसल्लकोरोप्रसावररोप्रभञ्जातकपलाशा नन्दीहचश्चेति ।

व्यथाधादिर्गणो व्रणः संघाहो भयसाधकः

रक्तपित्तहरो दाह-मीदोघ्नो योनिदोषहृत् ॥ २३

somnifera, Rumex vesicarius, Pentapetes phoenicea, Clitorea ternatea, Crotonaria verru-

गुडूचौनिम्बकुस्तुम्बुचन्दनानि पञ्चकषेति ।

एष सर्वज्वरान् हन्ति गुडूचादिस्तु दीपनः ।

हृन्नासारोचकच्छर्दि-पिपासादाहनाशनः ॥ २४

उत्पलरत्नोत्पलकुसुमदसौमन्त्रिककुवलयपुष्करिकाणि मधुकषेति ।

उत्पलादिरयं दाह-पित्तरक्तविनाशनः ।

पिपासाविषहृद्रोग-हृद्भिर्मूर्च्छाहरो गणः ॥ २५

सुसाहरिद्रादाहहरिद्राहरीतक्यामलकविभौतक-कुष्ठहैमवतो-वचापाठाकट रोहिणी
शार्ङ्गटातिविषाद्राविडोभङ्गातकानि चित्तकषेति ।

एष सुसादिको गन्धा गणः श्लेष्मसूदनः ।

योनिदोषहरः क्षन्ध-शोधनः पाचनसथा ॥ २६

हरीतक्यामलकविभ.तकानीति विफला ।

विफला तु त्रिदोषघ्नी मेहकुष्ठविनाशिनी ।

चक्षुष्या दीपनी चैव विषमज्वरनाशिनी ॥ २७

पिप्पलीमरिचधृङ्गवेराथीति विकटूकम् ।

तूषणं कफमेदोघ्नं मेहकुष्ठत्वगामयान् ।

निहन्त्याह्मीपनं गुल्म-पीनसाम्बल्यतामपि ॥ २८

आमलकी-हरितकी-पिप्पल्यसितकषेति ।

आमलकादिरित्येष गणः सर्वज्वरापहः ।

चक्षुष्यो दीपनो हृष्यः कफारोचकनाशनः ॥ २९

त्रपुसीसतावरजतल्लच्छलोहसुवर्णानि लोहमलकषेति ।

गन्धशदिरित्येष गरुडमिह्रः परः ।

पिपासाविषहृद्रोग-पाक्, मेहहरसथा ॥ ३०

लाघारिवतकुटजाशमारकटफलहरिद्राशयनिम्बसप्तच्छदमालव्यायमाणा चेति ।

cosa, Coccinea indica, Acorus calamus, Pyrotheca lagenaria and Plumbago zeylanica are emetics. And of them, fruits are to be used of the plants mentioned above up to Cassia tora, and from Crodia myxa roots are to be employed.

कषायक्षिप्तमधुरः कफपित्ताग्निनाशनः ।

कुष्ठक्रिमिहरश्चैव दुष्टत्रणविशोधनः ॥ ३१

पञ्च पञ्चमूलान्यत ऊर्ध्वं वक्ष्यामः । ततः त्रिकण्टककण्टकीद्वयप्रथमकपर्णौ विदारि-
मन्वा चेति कनीयः ।

कषायतिक्तमधुरं कनीयः पञ्चमूलकम् ।

वातघ्नं पित्तशमनं दुग्धघ्नं बलवर्धनम् ॥ ३२

बिल्वार्द्रिमध्यटुण्डु कपाटलाकाश्मर्यश्चेति मृदन् ।

सतिक्तं कफवातघ्नं पाके लघुप्रदीपनम् ।

मधुरानुरसश्चैव पञ्चमूलं मृदन् कृतम् ॥ ३३

अनयोर्दशमूलमुच्यते ।

जम्बूः श्रासहरी स्त्र्यैव कफपित्ताग्निनाशकः ।

आमस्य पाचनश्चैव सर्वज्वरविनाशनः ॥ ३४

विदारौसारिवारजनीगुड्ढ्योऽजगद्ग्नौ चेति वल्लीसंज्ञः ।

करमर्द्धं त्रिकण्टकशैरीयकशतावरीगृध्नव्य इति कण्टकरुंज्ञः ॥

रक्तपित्तहरी स्त्र्यै ती शोफतृणविनाशनी ।

सर्वमैहहरी चैव शुक्रदोषविनाशनी ॥ ३५

कुष्ठकाशनलदर्भकाष्टेक्षुका इति तृणसंज्ञकः ।

मूतदोषविकारश्च रक्तपित्तं तथैव च ।

अन्यः प्रयुक्तः क्षीरेण शीघ्रमेव विनाशयेत् ॥ ३६

सुसुतसंहिता, सूत्रस्थानम्, १८ ।

Purgatives : Ipomoea turpethum, Ipomoea nil, Baliospermum montanum, Salvinia cucullata, Jasminum sambac, Andropogon acicularis, Gymnema sylvestre, Lagenaria vulgaris, Argyreia speciosa, Euphorbia neriifolia, Cleome felina, Plumbago zeylanica, Achyranthes aspera, Poa cynosuroides, Saccharum spontaneum, Symlocos racemosa, Mallotus philippensis, Trichosanthes dioica, Stereospermum suaveolens, Areca catechu, Terminalia chebula, Phyllanthus emblica, Terminalia belerica, Indigofera tinctoria, Cassia fistula, Ricinus communis, Guilandina bonducella, Euphorbia neriifolia, Alstonia scholaris, Calotropis gigantea and Cardiospermum halicacabum are purgatives. And of them roots should be used of the plants up to Saccharum spontaneum, the bark from symlocos racemosa to stereospermum suaveolens, the pigmented granules of the fruit of mallotus philippensis, the fruits from Areca catechu to Ricinus communis, the leaves of Guilandina bonducella and Calotropis gigantea, and the gum-resins (milky exudations) of the rest.

Emetics and purgatives : Luffa amara, Stereospermum suaveolens, Andropogon acicularis, Luffa pentandra, and Memordica Charantia are emetics and purgatives combined.

Errhines : Piper longum, Embelia ribes, Achyranthes aspera, Moringa pterygosperma, Sinapis alba, Albizzia lebbek, Piper nigrum, Nerium odorum, Coccinea indica, Clitorea ternatea, Achyranthes fruticosa, Acorus calamus, Cardiospermum halicacabum, Pongamia glabra, Calotropis gigantea, Calotropis procera, Allium sativum, Aconitum heterophyllum, Zingiber officinale, Pinus webbiana, Garcinia xanthochymus, Ocimum sanctum, Ocimum album, Balanites roxburghii, Gymnema sylvestre, Citrus medica, Salvadora oleoides, Salvadora persica, Jasminum grandiflorum, Shorea robusta, Borassus flabelliformis, Bassia latifolia, lac, assafoetida, sodium chloride, wine, cow's urine and extract of cow's dung (ammonium) are errhines. Of these fruits should be taken from Piper longum to Piper nigrum, roots from Nerium odorum, bulbs from Allium sativum to Zingiber officinale, leaves from Pinus webbiana to Ocimum album, the bark from Balanites roxburghiana to Gymnema sylvestre, the flowers of the next three plants and the extracts of the following next three ; lac and assfoetida are resinous exudates, sodium chloride an earthly matter (mineral substance), and the cow's

urine and the dung are excretory products." *Suśruta* I. 39. 2-5¹¹¹.

Saccharine drugs : The *Asclepias* (the *kākoli* group, *Suśruta* I. 38. 17 led by *Gymnema balsimicum*), milk, butter, fat, bone-marrow, *Oryza sativa*, *Oryza praecox*, *Hordeum hexa-*

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पुष्पाङ्गकोविदारकर्ण्डुदारारिष्टान्गन्धाविदुलवन्धुजीवकन्नेताश्चपुष्पी-विन्धी-वचावनेम्वान्द-
चित्ताश्चेत्यूर्ध्वभागहराणि । तत् कोविदारपूर्वाणां फलानि । कोविदारादीनां
मूलानि ॥ १

तिष्ठता-श्यामा-दन्ती-द्रवन्ती-समला-शङ्खिनी-विषाणिका-गवाक्षी-च्छगलाक्षीकुक्-
मुवर्ण-क्षीरीचित्तककशिपिह्रीकुशकाशतिलककम्पिलक-रम्यक-पाटला-पूग -हरितक्यामलक-
विभीतकनीलिनी-चतुरङ्गुलैरश्च-पूतोकमहाह्वसतच्छदाक्ष्योतिष्ठतो चेत्यधोभाग-
हराणि । तत् तिलकपूर्वाणां मूलानि । तिलकादीनां पाटलान्मानां त्वचः ।
कम्पिलकफलरजः । पूगादीनामिरश्चान्मानां फलानि । पूतोका-रगूधयोः पत्राणि ।
शेषाणां क्षीराणीति ॥ २

कोशातकी समला शङ्खिनी देवदानी कारवेळिका चेत्युभयतोभागहराणि । एषां
स्वरसा इति ॥ ४

पिप्पली-विङ्कटपामार्गशिष्टुसिंहार्थकशिरोधमरिचकरवीरविन्धीगिरिकर्षि कालिण्डी-
वचा-ज्योतिष्ठतो- करञ्जाकालकैलगुनातिविषाशङ्खवेर-तालीश-तमालमुरसार्जकैङ्गुदीमिष-
शङ्खीमातुलुह्रीमुह्वी-पोलुजाती-शाल-ताल-मधूक - लाक्षाङ्गुलवणमद्योशङ्खद्रसमूत्रा-
णीति शिरोविरेचनानि । तत् करवीरपूर्वाणां फलानि । करवीरादो-
नानर्कान्मानां मूलानि । तालीशपूर्वाणां कन्दाः । तालीशादीनामर्जकान्मानां पत्राणि ।
इङ्गुदीमिषशङ्खोत्पत्तौ । मातुलुह्रीमुह्वीपोलुजातीनां पुष्पाणि । शालतालमधूकानां
साराः । ङ्गुलाश्चे निर्यासी । लवणानि पार्थिवविशेषाः । मद्यान्वासवसंयोगाः ।
जोमूत्रशङ्खद्रसो मलाविति ॥ ५

सुसुतसंहिता, सुतस्मान्न, १८.८

stichon, *Triticum æstivum*, *phaseolus radiatus*, fructus *Trapa hispinosa*, *Scrypus kysoor*, *Cucumis sativus*, *Cucumis melo*, *Cucumis anguinus*, *Lagenaria vulgaris*, *Cucumis utilis*, *Strychnos potatorum*, *Citrus aurantium*, *Buchanania latifolia*, *Nelumbium speciosum*, *Gmelina arborea*, *Bassia latifolia*, *Vitis vinifera*, *Phoenix sylvestris*, *Mimusops indica*, *Borassus flabelliformis*, *Cocos nucifera*, *Saccharum officinarum*, *Sida cordifolia*, *Mucuna pruriens*, *Batatas paniculata*, *Oxystelma esculentum*, *Tribulus terrestris*, *Sansevieria zeylanica*, *Fœnicum vulgare* and *Cucurbita pepo* contain saccharine substances.

Acids : *Punica granata*, *Phyllanthus embellica*, *Citrus medica*, *Spondias mangifera*, *Feronia elephantum*, *Carissa carondas*, *Peucedanum sowa*, *Zizyphus jujuba*, *Tamarindus indicus*, *Mangifera salvatica*, *Diospyros embryosterus*, fructus *Calamus rotang*, *Artocarpus lakucha*, *Rumex vesicarius*, *Citrus bergamia*, curdled milk (lactic acid content), whey, sour wine, sour gruel, fermented rice and barley water and other acetous fermentation products belong to the acid group.

Salines : Rock-salt, carbonate of lime (from incinerated shells and the salt is recovered by lixiviation), soda, potash, '*raumaka*' (salt made

from the water of the Roma lake, now known as Sambar), sea-salt, '*pakrima*' (salt obtained from the ashes of the grain spikes of barley), caustic soda, magnesia, alkaline earth (containing sodium carbonate) etc. belong to the saline class.

Pungents : Piperaceæ (led by *Piper longum* of the '*pippali*' group I. 38. 10), the *Ocimum* group (I. 38. 8.), *Vitex negundo*, *Moringa pterygosperma*, *Allium sativum*, *Cinnamomum camphora*, *Datura fastuosa*, *Cedrus deodara*, *Piper auranticum*, *Vernonia anthelmintica*, *Canscora decussata*, *Balsamodendron mukula*, *Cyperus rotundus*, *Gloriosa superba*, *Calosanthus indica*, *Sesbania grandiflora*, *Salvadora persica*, etc. and the gum-resins of the *Shorea robusta* group (I. 38. 5) are pungent.

Bitters : The *Cassia fistula* (I. 38. 3) and *Tinospora cordifolia* (I. 38. 24) groups, and *Hydrocotyle asiatica*, tops of *Calamus rotang*, *Curcuma longa*, *Berberis asiatica*, *Holarrhena antidysenterica*, *Capparis trifolia*, *Flacourtia cataphracta*, *Alstonia scholaris*, *Solanum indicum*, *Solanum xanthocarpum*, *Canscora decussata*, *Salvinia cucullata*, *Ipomœa turpethum*, *Luffa amara*, *Momordica myxa*, *solanum melongena*, *Capparis aphylla*, *Nerium odorum*, *Jasminum*

grandiflorum, *Andropogon acicularis*, *Achyranthes aspera*, *Ficus heterophyllum*, *Saraca indica*, *Herpestis monieria*, *Boerhaavia diffusa*, *Tragia involucrata*, and *Cardiospermum halicacabum* are bitter.

Astringents : The groups led by *Ficus bengalensis* (I. 38. 23), *Aglaia roxburghiana* (I. 38. 21), *Staphania hernandifolia* (I. 38. 22), *Symplocos racemosa*, *Terminalia chebula*, *Terminalia belerica*, *Phyllanthus embelica*, *Boswellia serrata*, *Eugenia jambu*, *Mangifera indica*, *Mimusops elengi*, *Diospyros embropteris*, *Strychnos potatorum*, *Stereospermum suaveolens*, *Barleria cristata*, *Bauhinia variegata*, *Caelogyne ovalis*, *Symplocos racemosa*, *Beta maritima*, *Marsilia quadrifolia* etc., *Oryza montana* etc., *Phaseolus mungo* etc., these in brief belong to the astringent class. "*Suśruta* I. 42. 15-20¹³⁹."

Alkalies : Alkalies are obtained from the ashes

189. तद्यथा—काकोल्यादिः क्षीर-घृत-वसा-मज्ज-शालि-घटिक-यव-गोधूम-
माषश्चाटककसेरुकदपुसै र्व्यादकालावुकालकृतकाङ्गुलीचपियालपुष्करबीजकाश्मर्यमधु-
कद्राश्चाख्यंरराजादनतालनारिकेलीचविकारवलातिवलात्मगुप्ताविदारौ-पयस्यागोक्षुरकक्षो-
रमोरट मधूलिकाकुम्भाष्टप्रवृत्तानि समासेन मधुरो वर्गः ॥ १५

दाडिमामान्नकमातुलुङ्गाभातककपित्थकरमह्वदरकीलप्राचीनामलक-तिमिङ्गीक-
कोशाम्बभयपारावतवेदफलकुङ्कुमाञ्जवेतसदन्तघट-दधि तक्र-सुराशक्तसीवीरतुषीदकाधान्या-
न्मधुराणि समासेनाहो वर्गः ॥ १६

of the following plants. "Holarrhena antidysenterica, Butea frondosa, Shorea robusta, Erythrina fulgens, Terminalia belerica, Cassia fistula, Symplocos racemosa, Asclepia gigantea, Euphorbia antiquorum, Achyranthes aspera, Bignonia suaveolens, Methonica superba, Justicia ganderussa, Musa paradisiaca, Plumbago zeylanica, Guilandina bonducella, Jasminum augustifolium, Nerium odorum, Alstonia scholaris, Premna spinosa, Abrus precatorius and Trichosanthes dioeco." *Suśruta* I. 11. 7¹⁰⁰.

सैन्धवसीवर्षल-विडपाकरोमकसामुद्रकपक्लिमयवचरोधप्रसृतसुवर्षिकाप्रभृतीनि समासेन लवणो वर्गः ॥ १७

पिप्पल्यादिः सुरसादिः शिणुमधुशिरः, मूलकलशुनसुमूलशीतशिवकुष्ठदेवदारु-हरिश्च-कावल्यामफलव्यागुगुलु-मुललाङ्गलकीशुकनासापोलुप्रभृतीनि सालसारादिश्च प्रायशः कटुको वर्गः ॥ १८

आरवधादिगुडूयादिर्लक्ष्मकपर्णोवेतकरीर-हरिद्राहयैन्द्रयववचस्वादुकण्टकसमपर्ण-हृत्तीक्ष्ण-शङ्खनी-द्रवन्नीविहत्-कृतवेधनकर्कोटककारवेल्लकवासक-करीर-करवीर-सुमनः शङ्खपुष्पापामार्गद्रायमाषाद्योकरोहिणीवैजयन्ती सुवर्षलापुनर्नवाह्निकालीन्योतिषतीप्रभृतीनि समासेन तिक्तो वर्गः ॥ १९

अथोषादिरन्ध्रहादिः प्रियङ्गादी रोगादिस्त्रिफला शङ्खकीजम्बू-अवकुलतिन्दुकफलानि कतकशकफलपाषाणभेदकवनस्पतिफलानि सालसारादिश्च, प्रायशः, कृबवकाकोविदारक-जीवन्तोषिङ्गीपालङ्गामुनिवचकप्रभृतीनि मोवारकादयो मुद्गादयो वैदलाश्च समासेन कषायो वर्गः ॥ २०

सुसुतसंहिता, स्वस्थानम्, ४९ ।

190. अद्यानेनैव विधानेन कुटजपलाशान्धकर्णपारिभौद्रकविमिश्रकारम्बधतिल-कार्ककुक्षपामार्ग-पाटला-मल्लमाल-वचकदलीधित्कपूतीकेन्द्रहृत्वाकोताम्बमारकासम्बदा-भिन्मन्थगुल्माश्चतस्रकोशतकीः समूलफलपत्राश्चा दष्टेन् ॥ ७

सुसुतसंहिता, स्वस्थानम्, ११ ।

Antiparasital Oils : "The oils of *Azadirachta indica*, *Linum usitatissimum*, *Carthamus tinctorius*, *Raphanus sativus*, *Andropogon serrata*, *Holarrhena antidysenterica*, *Luffa amara*, *Calotropis gigantea*, *Mallotus philipensis*, *Butea frondosa*, *Elettaria cardamomum*, *Salvadora persica*, *Pongamia glabra*, *Balanites roxburghii*, *Moringa pterygospermum*, *Sinapis alba*, *Cleome viscosa*, *Embelia ribes* and *Cardiospermum halicacabum* are acrid, irritant, pungent and they are beneficial in 'vāyu, kapha', parasital (or intestinal worms), or syphilitic skin lesions and headache." *Susruta* I. 45. 101¹⁹¹.

Diuretic and laxative oils : "The oils of *Ophelia chirayta*, *Eugenia dalbergioides*, *Terminalia belerica*, *Cocos nucifera*, *Zizyphus jujuba*, *Salvadora persica*, *Cælagyne ovalis*, *Buchanania latifolia*, *Bauhinia variegata*, *Gynandropsis pentaphylla*, *Cucumis sativus*, *Cucumis melo*, *Cucurbita pepo*, and *Benicassa cerifera* are sweetish, sedative, non-irritant, diffusive, laxative, diuretic and dyspeptic.

191. निम्बासती-कुसुम्भ-मूलक-जीमूतक-वचक-कृतवेधनार्ककम्पिङ्गक-हृदिकर्ष-
हृद्यौकापीलु-कार्जु-हृदीमिषु सर्वपसुवर्षलाबिकृद्भ्योतिषंतीपलतैलानि तीक्ष्णानि लघ-
नुचवीर्याणि कटूनि कटुविपाकानि सरास्यगिल्लकफलमिश्रुप्रमिडमिरीरीनृपादि-
चेति ॥ १०१

The oils of *Bassia latifolia*, *Gmelina arborea* and *Butea frondosa* are sweetish astringent and they remove the excess of 'kapha' and 'pitta'.

Bactericidal emetics and purgatives : The oils of *Hydrocarpus kurzii* (*tuvara* is popularly known as '*chaulmoogra*'), and *Semicarpus anacardium* are of astringent sweetish bitter taste, are calorific, emetic, purgative and bactericidal, and are specific in leprosy, adiposis and syphilis (syphilitic cutaneous manifestations).

Oxidizing oils : The oils of turpentine obtained from oleoresins (by distillation) of *Pinus longifolia*, *Cedrus deodara*, *Tithymallus antiquorum* (?), *Dalbergia sissoo* and *Aquilaria agallocha* are of astringent bitterish pungent taste and are beneficial in indolent ulcers, intestinal worms, catarrhal affection (of the respiratory tract) and scrofula.

Antiseptic Oils : The fruit-oils of *Lagerflora vulgaris*, *Mangifera sylvatica*, *Baliospermum montanum*, *Salvinia cucullata*, *Vernonia anthelmintica*, *Stereospermum suaveolens*, *Vitex negundo*, *Mallotus philippinensis* and *Andropogon aciculatus* are of bitterish-pungent astringent taste, are purgative and are beneficial in intesti-

nal worms, skin lesions and indolent ulcers." *Suśruta* I. 45. 106-110¹⁰².

The therapeutic value of these drugs is also significant. Many of them are of unquestioned effectiveness in the symptomatic treatment of the diseases for which they have been described. It is not possible here to go into details as to the chemical principles contained in them, for it will not only encumber the book with an extraneous subject, but many of them have not yet been analyzed in a modern laboratory. However, in the popular pragmatic test, they have shown their fitness of survival in competition with the foreign drugs which unmistakably demonstrates

192. किराततिक्तकाऽतिमुक्तक-विभोतक-गारिकेर-कोलाबोड्डीवन्तो-पियाल-
कर्ण्यदार-सूर्यबल्ली-त्रपुसैर्व्यादक-कर्कार-कुसाब्धप्रभृतीनां तैलानि मधुराणि मधुरवैर्य-
विपाकानि वातपित्तप्रशमनानि शीतवीर्याप्यभिष्यन्दोनि सृष्टविषमूत्राब्धप्रिसादनानि
चेति ॥ १०६

मधूककाऽम्यपलाशतैलानि मधुरकवायाणि कफपित्तप्रशमनानि ॥ १०७

तुवरकमल्लतकतैले च च मधुरकवाये तिक्तामुरसे वातकफकुष्ठमिदोमिहक्लिमिहरे
उभयतोभागदीपहरे च ॥ १०८

सरलदेवदार-गच्छोर-शिंगपागुदसारकेहासित-कटु-कवाया दुष्टप्रचयोधनाः क्लिप्त-
कफकुष्ठानिलहराश्च ॥ १०९

तुम्बोकोशाखदन्तोद्वन्तोश्शामासप्तलानीलिकाकम्पिहकशङ्खिनोकेहासितकटु-कवाया
चोभयतोभागदीपहराः क्लिप्तकफकुष्ठानिलहरा दुष्टप्रचयोधनाश्च ॥ ११०

सुसुतसंहिता, सुसुखानम, ४५ ।

their therapeutic worth. * Opothraphy was known in its crude form (*Charaka* I. 1. 35). Of course it is too much to expect that it was known that the activating principles of the glands—the hormones, were not destroyed by gastric digestion or boiling at ordinary temperature, or they knew to extract chemically pure thyroïdin, adrenalin, paracreatin or spermin, but they prescribed, never-the-less the testicles of goat and cock as potent aphrodisiac (*Charaka* VII. 2. 13.¹⁰³ ; VII. 2. 28.¹⁰⁴). It is very

* Those who are further interested in the subject, will find in '*A Comparative Hindu Materia Medica*' which is under preparation, and which contains their synonyms, expressions in the vernacular provincial dialects, Arabic, Persian, Latin, Greek, English, French and German, their botanical order and classification, chemical analysis when known and their popular therapeutic uses, as well of the allied genera in other countries.

193. ईषत् सलवचं युक्तं धान्यजीरकनागरेः ।

एव हृष्यश्च बल्यश्च हृहृष्यश्च रसोत्तमः ॥

चरकसंहिता, चिकित्सास्थानम्, ९ ।

194. तमे सर्पिं वि नक्राखं तावच्चूडाखमिश्रितम् ।

युक्तं वटिकचूर्णेन सर्पिं वाभिनवेदे च ॥

पक्षा पूषणिकाः खादिहारणीमरूपो नरः ।

य इच्छेद्वचनम् प्रसीक्तुं गजवच यः ॥

चरकसंहिता, चिकित्सास्थानम्, ९ ।

likely that the biliary calculus (*rochanā*) was given in intestinal putrefaction, in case of insufficiency of biliary salts, and the cow's urine was used in cooking the alkalies in order to add the ammonium to the alkalies to make them more caustic (*Suśruta* I. 11. 6), and the dessiccated cow's dung was either used as a fuel for cautery or as heat-absorbent in which some liquid preparations were kept for ripening.

VII. SURGERY.

“There are eight kinds of surgical operations, namely, excision (*chhedya*), incision (*bhedya*) scarification (*lekhya*), puncturing (*vedya*), exploration (*esya*), extraction (*āhārya*), drainage (*visrāvya*) and suturation (*sūrya*). For any of these operations, the surgeon must have the following materials ready at hand and at his disposal, namely the blunt surgical instruments (*yantra*), sharp instruments (*śastra*), caustics (*kṣāra*), cautery (*agni*), probes (*śalākā*), speculum (*śṛṅga*), bottle-gourd (*alāvū*), bougie (*jāmvavausṭha*), cotton (*pichu*), pad or lint (*plota*), silkworm gut (*sūtra*), sponge (*patra*=leaf?), bandage (*pañṭa*), honey, clarified butter, fat, milk, oils, irrigator (*tarpaṇa*), disinfectants (*kaṣāya*), liniments (*ālepana*), paste or ointment (*kalka*) and other auxiliary requisites.” *Suśruta* I. 5. 3 ¹⁹⁵.

195. तच्च यस्मिन्कर्मोपविधम् । तद्यथा—हेयं मेयं क्षेप्यं विध्यमिच्छनाह्वयं
विस्त्रायं सोम्यमिति । अतोऽन्यतमं कर्म चिकीर्षता वदेत्तत्र पूर्वमेवोपकथयितव्यानि
भवन्ति—तद्यथा यस्मिन्कर्मोपविधायिण्याकाशज्जलीकालादुज्ज्वलवोहपिपुत्रोत्सृज्यपत्र-
मधुहृतवशापयक्षीकृतपथ्यकषायालेपन-कल्कव्यजनशोथोदककटाहोदीनि परिकर्मिणश्च
स्निग्धाः स्त्रिरा बलवताः ॥ ३

सूत्रतत्त्वज्ञिता, सूत्रज्ञानम्, ५ ।

“There are one hundred and one kinds of blunt instruments (*yantra*), of which the hand is the most important, for the hand controls the application of all the (surgical) instruments and without it (an adept hand), they can not be manipulated. Whatever (foreign body) causes pain to the body and the mind, is called ‘*śalya*’ and the instruments that are necessary to extract the ‘*śalyas*’ are called ‘*yantras*’. *Yantras* are of six kinds, namely (1) Cruciform forceps (*svastika yantra*), (2) pincer-like forceps (*sandamśa yantra*), (3) pick-lock forceps (*tāla yantra*), (4) cannula (*nāḍī yantra*), (5) probes (*śalākā yantra*) and (6) accessory appliances (*upayantra*). Of them the cruciform forceps are of forty kinds, pincer-like forceps of twenty kinds, pick-lock forceps two kinds, cannulata twenty kinds, probes twenty-eights kinds and accessory appliances are of twenty-five kinds. They are usually made of (steel) iron, but, (if it be not available, they can be also made) of similar (hard) metal. Their blades are shaped like those of the carnivorous animals, deer, or birds. Therefore likewise they should be manufactured, or according to the rules in the surgical text-books, or according to the instruction of an expert of surgical instruments. They should be of normal size, and according

to the needs, either with sharp edges or with polished curbed ends, of firm structure, pleasant appearance and with a good handle.

Swastika Forceps :—The swastika forceps should be eighteen fingers' breadth long (about 12 inches) and their blades shaped like the jaws of a lion (*simha* : 1. Ferguson's lion-jaw bone-holding forceps—*osteophore*—with strong blades and teeth to crush and divide bone) ; tiger (*vyāghra* : 2. A bone-gnawing forceps with double-jointed, short, concave blades, having sharpened edges) ; wolf (*vrka* : 3. Ferguson's bone-holding forceps, having long, strong handles, and short, straight or curved jaws serrated on their internal faces) ; hyena (*tarakṣu* : 4. Farabeuf's forceps with strong grasping teeth all along the inner surface of each blade) ; bear (*bhalluka* : 5. Bulldog forceps with sliding catch, concave, expanded and fenestrated extremities and at the tips, fine teeth) ; panther (*dvīpī* : 6. Gross's bullet forceps with one blade hooked and the other fenestrated and toothed) ; cat (*mārjāra* : 7. Mouse-tooth forceps, with one or two fine points at the tip of each blade, fitting into hollows between the points on the opposite side) ; jackal (*śrgāla* : 8. Bone forceps, used for seizing and tearing away fragments of bone) ; deer (*hariṇa* ;

9. Bedford's obstetric forceps, short-handled, movable-jointed and having long, curved, fenestrated blades) ; stag (*ervvāruka* ; 10. Bullet-forceps, single-jointed, having long delicate blades, the tips being expanded and concave on their internal side to correspond to the spherical shape of the bullet, or the tips are hooked, so that they may be forced into the bullet) ; crow (*kāka*), heron (*kaska*), osprey (*kurara*), golden jay (*chasa*), vulture (*bhāsa*), hawk (*śaśaghātī*), owl (*lūka*), kite (*chilli*), black vulture (*śyena*), falcon (*grdhra*), crane (*krauñcha*), '*vr̥ṅgarāja*, *añjali-karṇa*, *avabhañjana*, *nandimukha*' etc. (Dental forceps, double-jointed, having long handles of various curves, and short jaws set at various angles and shapes to hold and extract different teeth in the upper and the lower jaw, resembling the beak of birds). The blades (of the *swastika* forceps) should be joined by a lentil-like (*Ervum lens*) joint, and the handles should be curved like the elephant-driver's hook. The '*swastika* forceps' are used in extracting foreign bodies impacted in bones (foreign bodies were usually sharp-pointed iron-arrows, used in ancient Indian warfare, and though the comparative forceps, mentioned above, may be similar, they can not be the same, as it needed different kinds

of forceps to extract sharp-pointed, possibly thin-plated steel-arrows, impacted in bones ; the comparison has only been made to give an idea of the similarity of the construction of the forceps, used in ancient and modern surgery).

Pincer-like Forceps : The pincer-like forceps (*sandamśa yantra*) are of two kinds, jointed and with sliding catch-spring. They should be 16 fingers' breadth long (about 10 inches) and they are used in extracting foreign bodies in the skin, tissues, vessels and nerves (*śirā*) and tendons.

Pick-lock Forceps : Pick-lock forceps should be made 12 fingers' breadth long (about 8 inches), like the jaw of fish (dolphin), serrated either on one blade or both the blades and they are used in extracting foreign bodies from the aural and nasal passages (Alligator forceps, having delicate, straight or curved wide-opening jaws, for use in narrow canals).

Tubular instruments : Tubular instruments (*nāḥi yantra*) are many and they serve various purposes. Some of them have opening at one end, and others at both ends (or some are single-barrelled, and others are double-barrelled). They are used for the extraction of foreign bodies from vessels (Tubular forceps, with long and

slender blades, intended for use through a cannula or other tubular instrument), for the exploration of (internal) lesions (*Bougie*, a cylindrical instrument, resembling a Sound, usually more or less flexible and yielding, and which is employed in the diagnosis and treatment of stricture of tubular passages, such as the urethra or the rectum ; *Probe*, a slender rod of silver or other flexible metal, with blunt bulbous tip, and which is used for exploring sinuses, fistulas or other cavities ; Sound, an elongated, cylindrical, usually curved instrument of metal and which is used for exploring the bladder or other cavities of the body, or for dilating strictures of the urethra or other canal ; with the general use of electricity, many devices have been perfected, by introducing a tiny incandescent bulb at the end of the tube and a reflector at the top, which projects the exact condition of the internal organs as larynx, pharynx or urethra, through laryngoscope, pharyngoscope and urethroscope), for suction of fluids (as *Catheter*, for draining away urine from the bladder, in case of its retention from any cause ; or *Trocar* for withdrawing fluid from any cavity, as in hydrocele), and for facilities for other operations (as Director in lithotomy). The

breadth and the length of the tubular instrument should harmonize with the narrow canal (in which it is to be used). The tubular instruments that are used in fistula-in-ano, gummata, tumors, abscesses, for injection, irrigation, in hydrocele, ascites, for fumigation, in stricture of urethra, and stricture of the rectum, and other instruments such as '*alāvu yantra*' (-bottle-gourd ?) and speculum will be mentioned later.

Probes : The probes (*śalākā yantra*) have various uses ; their dimension and their length are dependent on their requirements. They have their ends shaped like an earthworm, the feathered part of an arrow, the hood of a snake, or a fish-hook, and there are two varieties of each kind. They are used for exploration (*eṣaṇa*, such as Bougie, probe or sound), retraction (*vyūhana*, as by a Retractor), grafting (*chālana*) and extraction (*āharaṇa*, by a tubular forceps). For extraction of foreign bodies from vessels, two *śalākā* forceps (Haemostatic forceps) are used, whose ends are slightly flattened like those of a lentil (*Ervum lens*). Six are used for the drainage of pus having ends covered with cotton. For the application of caustics, three kinds are used whose ends are shaped like a spoon with a conical cavity. For cautery six kinds are used of which

the orifice is shaped like the fruit of *Eugenia jambolama*, and the other like that of the elephant-driver's goad. For the removal of the nasal polypi, one kind is used whose orifice is shaped like half the stone of *Ziziphus jujuba*, of conical formation with sharp edges (Meyer's ring knife or Luc's forceps). One kind is used for the application of ointment (in the narrow aural or nasal passages) whose both extremities are shaped like a pea or a flowering-bud (as in Tilley's Burr). For the urethral passage one kind is used whose circumference is like the flower-stalk of *Jasminum grandiflorum*.

Accessory Appliances :—The accessory appliances are thread, twine, bandage, skin-gloves, (*charmmānta*), birch-skin (*valkala* = bark), (tendril of) creeper (for gently dislocating foreign bodies from delicate sensitive organs or abscess cavities), lint, a large rounded stone, hammer (for loosening foreign bodies impacted in bone), the palm of the hand, the sole of the foot, finger, tongue, tooth, nail, mouth (for suction of the fluid as in ascites), hair, horse-hair (for saturation), a branch (of a tree, for extracting foreign bodies, from superficial wounds), expectoration, fluxing (causing discharge in the eyes or throat to remove foreign bodies), cheer-

fulness, loadstones (used for finding out whether there are iron fragments in the wounds, as loadstones possess polarity and are attracted by iron), caustics, cautery and medicines (including disinfectants).

These instruments can be applied all over the body, any of the limbs, joints, viscera and vessels (including nerves).

Extraction (of foreign bodies with pulling : *nirghātana*), injection (of disinfectants in the bladder or enema in the rectum, *pūraṇa*) : bandaging (*vandhana*); retraction (of the lips of the wound by a 'Retractor' for inspection, extraction of the foreign body and disinfection, (*vyūhana*) : replacement (of the lips of the wound in their proper place : *varttana*), grafting (principally cutaneous, to cover the wounded scar : *Chālana*), wrenching (of a foreign body, with a forceps to facilitate its extraction : *vivarttana*), dilatation (of any canal or cavity by a 'speculum' for exploration : *vivarāṇa*), pressing (of the wounded parts to loosen the foreign body, or for the drainage of the pus, if suppuration has taken place : *pīḍana*), disinfection (of the wound, canal or cavity : *viśodhana*), extraction (with force : *vikarṣaṇa*), pulling out (*āharaṇa*), pulling gently to and fro (to loosen the foreign body : *āñchhana*), elevation (of the

foreign body, in order to loosen it : *unnamana*), depression (of the foreign body : *vinamana*), pressure (by manipulation of neighboring tissues : *bhañjana*), suction (by a tube of the fluids, as in hydrocele or ascites : *āchūṣaṇa*) exploration (of canal or sinus : *eṣaṇa*), splitting up (a foreign body, to facilitate its removal : *dāraṇa*), straightening (of the foreign body, in order to loosen it : *rjukaraṇa*), irrigation (of the wound with an 'Irrigator' : *prakṣālaṇa*), blowing disinfectant powders, vulneraries or errhines to deep-seated wound, narrow canal or nasal passage : *pradhamana*), and rubbing (with hair-brush any wound cavity : *pramārjjaṇa*)—these twenty-four are the uses of the 'yantra' (blunt instruments).

As the foreign bodies can be of infinite varieties, so a wise surgeon must intelligently choose his instrument for each individual case.

Defects in Instruments : Too cumbersome or light, long or short appliances, the blades lacking the power of grasping, or grasping it badly, bent, shaky, too-high-jointed or loose-jointed, loose-bladed or loose-tipped appliances are the twelve defects in 'yantra' (blunt instruments).

'The instrument' that is free from these defects, and which is eighteen fingers' breadth long,

is the only proper one, which the surgeon must select in surgical operations. The surgeon shall extract, according to the surgical code, the visible missile (*śalya*) by the '*Lion-jaw forceps*' and the invisible missiles by '*kaṅka-mukha*' (*heron-beaked forceps* = dental forceps).

Among the '*yantras*', '*heron-beaked forceps*' is the best, as it can be easily introduced everywhere, and easily withdrawn with the extracted missile". *Suśruta* I. 7. 2-18 ¹⁹⁰.

196. यन्त्रशतमेकोत्तरमम हस्तमेव प्रधानतमं यन्त्राणामवगच्छ । यस्माद्वक्ताहते यन्त्राणामप्रवृत्तिरेव तदधीनत्वाद् यन्त्रकर्मणाम् ॥ २

तत्र मनःशरीराबाधकराणि शल्यानि, तेषामाहरोपायो यन्त्राणि । तानि षट्-प्रकाराणि । तद्यथा, स्लक्षिकयन्त्राणि । सन्दंश-यन्त्राणि । तालयन्त्राणि । नाड़ी-यन्त्राणि । शलाकायन्त्राणि । उपयन्त्राणि चेति ॥ ३

तत्रोचतुर्विंशतिः स्लक्षिकयन्त्राणि । हे सन्दंशयन्त्रे । हे एव तालयन्त्रे । विंशतिर्नाशः । षट्शतविंशतिः शलाकाः । पञ्चविंशतिरुपयन्त्राणि । तानि प्रायशो लोहानि भवन्ति तत्प्रतिरूपकाणि वा तदलाभे । तत्र नानाप्रकाराणां व्याख्यानं स्रग्-पक्षिणां मुखैर्मुखानि यन्त्राणां प्रायशः सदृशानि तस्मात् तत्सारूप्यादागमादुपदेशादन्व-यन्त्रदर्शनाद् युक्तितश्च कारयेत् ॥ ४

समाहितानि यन्त्राणि स्वरस्यसुखानि च ।

सुहृदानि सुरुपाणि स्रग्पक्षिणि च कारयेत् ॥ ५

तत्र स्लक्षिकयन्त्राण्यष्टादशाङ्गुलप्रमाणानि सिंहायान्नरकतरुचक्रचर्षीपिमाज्जि-शृगालशृगेर्ध्वारककाककडकुररचासभासशशचात्यलूकचिल्लिग्रयेन-गृध्रकौच-भङ्गराजाञ्जलि-कर्षावभञ्जन-नन्दिमुखसुखानि मसूराज्जतिभिः कौलैरववज्जानि मूलीऽङ्गुश्वदावतवारङ्गा-ञ्जलिबिन्दुशृङ्गोत्तरार्थमुपदिशन्ते ॥ ६

Sharp Instruments : Sharp instruments (śāstra) are of twenty kinds. They are as follows : (1) *Circular knife* (maṇḍalāgra) ;

सनियङ्कोऽनियङ्गश्च सन्दंशौ षोडशाङ्गुली भवतस्त्वस्त्रांसशिरास्त्रायुगतश्लोङ्करणार्थ-
मुपदिश्येते ॥ ७

तालयन्त्रे द्वादशाङ्गुली मत्स्यतालुवदेकतालद्वितालके कर्णनासानाडीश्लेष्मानामाह-
रणार्थम् ॥ ८

नाडीयन्त्राणि अनेकप्रकाराण्यनेकप्रयोजनान्येकतोमुखान्युभयतोमुखानि च, तानि
क्षोतोगतश्लोङ्करणार्थं रोगदर्शनार्थमाचूषणार्थं क्रियासौकर्यार्थञ्चेति । तानि क्षोतो-
द्धारपरिणाहानि यथायोगपरिणाहदीर्घाणि च । भगन्दराशोऽर्जुनद्रव्यवस्तुत्तरवस्तिमूत्र-
वृद्धिदोदरधूमनिरुद्धप्रकशसन्निरुद्धगुदयन्त्राण्यल्लावृष्टं यन्त्राणि क्षोपरिष्ठाद् वक्ष्यामः ॥ ९

शलाकायन्त्राण्यपि नानाप्रकाराणि नानाप्रयोजनानि यथायोगपरिणाहदीर्घाणि
च । तेषां गच्छपदशरपुङ्खसर्पफणवङ्गिमुखे द्वे द्वे एषणवृद्धनचालनाहरणार्थमुप-
दिश्येते । मसूरदलमावमुखं द्वे किञ्चिदानताये क्षोतोगतश्लोङ्करणार्थम् । षट्
कार्पासकृतोष्णोष्वाणि प्रमाञ्जनक्रियासु । वीणि दर्व्याकृतानि खल्लमुखानि चारौषध-
प्रणिधानार्थम् । वीण्यन्त्राणि जाम्बवदनानि वीण्यङ्गुश्वदनानि षडेत्राग्निकर्म्मस्त्रभि-
प्रेतानि । नासार्जुदहरणार्थमेकं कोलास्थिदलमावमुखं खल्लतौष्णीष्ठम् । अस्त्रनाथ-
मेकं कलायपरिमच्छलम् भयतो मुकुलाय । मूत्रमार्गविशोधनार्थमेकं मालतीपुष्प-
वन्त्रायप्रमाणपरिमच्छलमिति ॥ १०

उपग्रन्थाण्यपि रज्जुवेणिकापट्टचर्मोन्मवल्कल लतावस्त्राष्ठोलाश्ममुद्गर-पाणिपाद-
तलाङ्गुलि-जिह्वादन्त-नखमुख-वालाश्व-कटकशाखाष्ठ-वनप्रवाहणद्वयार्थस्त्रान्मभयानि चा-
राग्निमेवजानि चेति ।

एतानि देहे सर्व्वेभ्यन् देहस्यावयवे तया ।

सन्धौ क्षोष्ठे धमन्वाच्च यथायोगं प्रयोजयेत् ॥ ११

यन्त्रकर्माणि तु निर्घातनपूरणवन्धनवृद्धनवत्तनचालनविवर्त्तनविवरण-पोदनानाम् --

(2) *Saw* (*kara-patra*, resembling hand, that is, consisting of a thin blade with sharp teeth in the edge, as the hand has fingers); (3) *Lancet* (*vrddhi-patra*, a short, wide, sharp-pointed and two-edged blade, resembling the leaf of '*vrddhi*'—*Batata edulis*); (4) *Canalicular knife* (*nakha-sastra*, resembling nail-parer); (5) *Gum lancet* (*mudrikā*, a short lancet of the size and shape of the last phalanx of the index finger); (6) *Thumb lancet* (*utpala-patra*, resembling the petal of *Nymphæa stellata*); (7) *Amputating knife* (*arddha-dara*, a single-edged

विशोधनविकर्षणाहरणाच्छनोन्नमनविनमन-भक्षणोन्नयनाच्चूर्णवणदारणञ्जकरण-प्रक्षा-
खन-प्रधमनप्रमाञ्जनानि चतुर्विंशतिः ॥ १२

खड्गद्वारा चापि विभजेद् यस्त्वकर्माणि बुद्धिमान् ।

असंख्येयविकल्पत्वाच्छलानामिति निश्चयः ॥ १४

तत्रातिस्त्रुलमसारमतिदीर्घमतिजलजग्राहि-विषमग्राहि वक्रं शिथिलमत्युन्नतं खट्वक्षौखं
खट्वमुखं खट्वपाशमिति द्वादश यन्त्रदोषाः ॥ १५

एतेर्दोषे विनिर्मुक्तं यन्त्रमष्टादशाङ्गं लम् ।

प्रशक्तं भिवज्जाज्ञेयं तद्धि कर्म्मसु योजयेत् ॥ १६

दृश्यं सिंहेसु खाद्यैस्तु गूढं कङ्कतु खादिभिः ।

निर्हरेत् तु शनैः शल्यं शस्त्रयुक्तिव्यपेक्षया ॥ १७

निवर्त्तते साध्वगाहते च शल्यं निगृह्योन्नरते च यज्यात् ।

यन्त्रोपेतः कङ्कतुखं प्रधानं स्थानेषु सर्व्वेष्वधिकारि चैव ॥ १८

सुश्रुतसंहिता, सूत्रस्थानम्, ७।

cutting instrument) ; (8) *Needle* (*sūchī*, a slender, sharp-pointed instrument, used for puncturing the tissues, for guiding the thread in suturing or for passing a ligature round an artery); (9) *Bistoury* (*kuṣa-patra*, a long, narrow-bladed knife, shaped like the 'kuṣa' grass—*Eragrotis cynosuroides*) ; (10) *Hawk-bill scissor* (*āṭī-mukha*, an instrument with two blades, held together by a rivet, moving on the pivot and cutting against each other, resembling the bill of 'āṭī' bird—*Turdus Ginginianus*) ; (11) *Scissor* (*sarārī-mukha*, resembling the long and slender beak of heron) ; (12) *Concave bistoury* (*antaramukha*, having curved blade inside) ; (13) *Trocar* (*trikūrchchaka*, an instrument for withdrawing fluid from a cavity or for use in paracentesis, consisting of a metal tube—'cannula', open at both ends, in which fits a rod with a sharp three-cornered tip, which is withdrawn after the instrument has been pushed into the cavity ; trocar is derived from French 'trois'—three, + 'carre'—side, having the same meaning of 'tri-kūrchchaka') ; (14) *Lenticular knife* (*kuṭhārikā*, an axe-like knife, resembling-cow's tooth) : (15) *Aspirating needle* (*vrihi-mukha*, a hollow needle, used for withdrawing fluid from a cavity, an aspirator tube being attached to one end, the other end, shaped like

the rice grain, being thrust into the cavity); (16) *Iredectomy knife* (*ārā*, an arrow-headed knife, resembling an owl); (17) *Scalpel* (*vetasa-patra*) a pointed, long and slender knife with convex edge, resembling the rattan leaf); (18) *Hook* (*vaḍiṣa*, an instrument curved or bent near its tip, used for fixation of a part or traction); (19) *Scaler* (*danta śaṅku*, an instrument to remove tartar from the teeth); (20) *Fine-pointed probe* (*eṣaṇī*, used for dilating contracted lacrymal puncta or examining the lacrymal canals).

Uses : Of them, the Circular Knife and the Saw can be used for excision and scarification; Lancet, Canalicular Knife, Gum Lancet, Thumb Lancet and the Amputating Knife for excision and incision; Needle, Bistoury, Hawk-bill Scissor, Scissor, Concave Bistoury and the Trocar for drainage (of the fluid cavities); Lenticular Knife, Aspirating Needle, Iredectomy Knife and the Scalpel for puncturing; the Needle can also be used for puncturing; Hook and the Scaler for extraction (scraping of tartar from the teeth etc.); Fine-pointed Probe for finding out the passage and the direction of a sinus; and Needles for suturation. In these eight kinds of action the use of '*śastra*' (sharp instruments) are described.

The way these instruments shall be handled, shall be described now. The lancet and other incising instruments should be held by the top and the middle of the handle. For scarification, the Lancet and the Circular Knife should be held with slightly bent hand. All the drainage instruments should be held by the top of the handle. For the drainage of the fluid cavities, children, the aged, the delicately constituted, the timid, women, kings and the princes, the Trocar should be employed. Of the Aspirating needle, the Aspirator should be held in the palm of the hand, and the needle between the thumb and the index finger. The handle of the Lenticular knife should be held in the left hand, and the index and middle fingers of the right hand should be pressed upon it during operation. Ireductomy Knife, Saw and the Fine-pointed Probe should be held by the root (middle of the handle.). The rest of the instruments should be held properly (as to give the most effective result).

The shapes of these instruments are indicated by their nomenclature. And the Canalicular Knife and the Fine-pointed Probe are eight fingers' breadth long (about 5 inches). Needles shall be described later. The extremity of the Hook and the Scaler is slightly curved, and it is

sharp like the thorn or fine like the young leaf-blade of *Hordeum hexastichum*. The orifice of the Fine-pointed Probe is like that of an earthworm. The Gum Lancet is of the size of the top phalanx of the forefinger. The Scissor is ten fingers' breadth long (about 6 inches). And the rest of the instruments are about 6 fingers' breadth long (about 4 inches).

Good Instruments : The instruments which have good handles, are made of good iron (steel), are sharp, well-formed, and whose edges are fine and even, and without indentation, are the best.

Defective Instruments : The instruments that are bent, blunt, broken, jagged, too cumbersome, too light, too long or too short, are defective (these are the eight defects in sharp instruments). The sharp instruments that have the opposite qualities of these, are to be used, excepting that of the Saw, where the jagged sharpness is necessary for sawing bones, for which it is used.

Edges of the Instruments : The edge of the incising instruments should be like the thickness of the tip of *Ervum* lens, of the scarifying instruments, half the thickness of that of *Ervum* lens, of the puncturing and the draining instruments like that of hair, and of the excising instrument half the thickness of the tip of hair.

Sterilization of the Instruments : Sterilization (*pāyanā*) of the instruments can be accomplished in three ways : (1) by caustics ; (2) by water (by boiling the instrument in water) ; (3) by oils (by immersing the instruments in antiseptic oils). The instruments that are used in the excision (extirpation) of missiles, foreign bodies and bone (saw) should be sterilized by caustics. The instruments for the excision and incision of the tissues should be sterilized in water. The instruments that are used for the excision of vessels and tendons, should be sterilized in (antiseptic and boiling) oils. For sharpening the instruments, pale, polished stone should be used, and to prevent the dullness of the edge (and rusting), they should be incased in a box, made out of the wood of silk-cotton tree (*Bombax heptaphyllum*).

The instruments that are very sharp and bright, and supplied with good handles and are of proper size, should only be used in operation."

Suśruta I. 8. 2-10¹⁹⁷

197. विंशतिः शस्त्राणि । तद्यथा । मण्डलायकरपत्रहृदिपत्रमखशस्त्र-मुद्रि-
कोत्पलपत्रकाञ्चदार-रुचो-कुशपत्राटीमूख-शरारिमुखान्तर्मुखतिक्ष्णक - कुठारिकाग्रीहि-
मुखारोवेतसपत्रक-वह्निश-दन्तशङ्ख-वस्त्र इति ॥ २

तन् मण्डलायकरपत्रे स्थातां हेदने वीक्षने च । हृदिपत्रं मखशस्त्रमुद्रिकोत्पलपत्र-

Lesions that need Excision Operation :
 "Excision (or extirpation) should be performed

कार्दधारणि छेदने भेदने च । सूचीकुशपताटीमुखशरारिमुखान्मुखतिशृङ्खलानि
 विस्त्रावये । कुठारिकाव्रीहिमुखारावेतमपत्काणि व्यधने सूची च । बड़िशं दन्तशङ्कु-
 खाहरये । एषस्य पक्षयोऽपानुलोम्ये च । सूच्यः सेवने । इत्यष्टविधे कर्म्मस्युपयोगः
 शस्त्राणां व्याख्यातः ॥ ७

तेषामथ यथायोगप्रवृत्तसमासोपायः कर्म्मसु वक्ष्यते । तत् इद्विपत्तं हन्तफल-
 साधारणे भागे गृह्णीयाद्देनान्ये वं सर्वाणि । इद्विपत्तं मण्डलायस्य किञ्चिदुत्तान-
 पाणिना लेखने बहुशोऽवधार्यम् । हन्ताये विस्त्रावणानि । विशेषेण बालहन्त-
 सुकुमारभोरुनारोणां राश्यां राजपुत्राणाञ्च तिशृङ्खलानि विस्त्रावयेत् । तलप्रच्छादितहन्त-
 मङ्गुष्ठप्रदेशिनोभ्यां व्रीहिसुखम् । कुठारिकां वामहस्तन्यस्तानितरहस्तमध्यमाङ्गुल्याङ्गुष्ठ
 विष्ठम्भयामिहन्तात् । आराकरपत्तौ वल्लो मूले । शेषाणि तु यथायोगं गृह्णीयात् ॥ ८

तेषां नामभिरिवाकृतयः प्रायेण व्याख्याताः । तत्र मुखशङ्कुष्यखावटाङ्गुली,
 सूची वक्ष्यन्ते । बड़िशं दन्तशङ्कुनानताये तीक्ष्णकण्टकप्रथमयवपत्रमुखे । एषस्य
 गण्डपदाकारमुखी । प्रदेशिन्यपर्वप्रदेशप्रमाणा मुद्रिका । दशाङ्गुला शरारिमुखी
 सा कर्त्तरीति कथ्यते । शेषाणि तु षडङ्गुलानि ॥ ९

तानि सुग्रहाणि सुलोहानि सुधाराणि सुरूपाणि सुसमाहितमुखशाण्डकरालानि चेति
 शस्त्रसम्पत् ॥ ६

तत्र वक्त्रं कुण्डं खण्डं खरधारमतिस्थूलमत्यल्पमतिदीर्घमतिऊस्त्रमित्यष्टौ शस्त्र-
 दोषाः । अतो विपरीतगुणमाददीत अन्यत् करपत्तात् तच्च धरधारमतिस्थच्छेदनार्थम् ॥ ७

तत् धारा भेदनानां मासूरी, लेखनानामर्भमासूरी, व्यधनानां विस्त्रावणानाञ्च
 कौशिकी, छेदनानामर्भकौशिकीति ॥ ८

तेषां पायना त्रिविधा चारोदकतैलेषु । तत् चारपायितं शरशल्यास्थिच्छेदनेषु ।
 शङ्कपायितं मांसच्छेदनभेदनपाटनेषु । तैलपायितं सिरान्यवधनवायुच्छेदनेषु । तेषां
 निशाचार्थं श्लक्ष्णिला माषवर्णा, धारासंस्थापनार्थं शास्त्रीलीफलकमिति ॥ ९

in fistula-in-ano, tubercles, suppurative tumors, non-suppurative tumors, gummata, wart, foreign bodies in bones and tissues, hairy moles, Sarcoma, tonsillitis, sloughing tendons-muscles and vessels, tumor of the palate, condylomata, myxoma of the gullet, chancre, fibroma and myoma.

Lesions that need Incision : Incision (lancing) should be made in all (suppurative) tumors, except those caused by the derangement of the three humors (non-suppurative tumors), erysipelas, oscheopyedema, bubo, diabetic boils, carbuncle, galactoposterma (or mastosyrinx), pustules of the penis, sty, pustules of the foot, fistula, suppurative tonsillitis, suppurative eruption of the penis, gumma of the cornea, pustular abscesses, abscess on the palate, gum-boils, the tumors or sinuses that develop after suppuration, cyst formed round the nucleus of a calculus, or any other kind of suppurative tumor.

Lesions that need Scarification : Scarification should be made in the four forms of throat inflammation, leucoderma, ranula, inflammation of the gum, tubercles, lachrymal fistula, epiglottitis,

यदा मुनिश्रितं शस्त्रं रोमच्छेदि मुसंस्थितम् ।

सुगृहीतं प्रमायेन तदा कर्षसु योजयेत् ॥ १०

सुसुतसं हिता, सूतस्थानम्, ८१

gummata of the throat, **psoriatic patches**, and **granulations**.

Lesions that need Punctures: Punctures should be made in **cirroid aneurysm**, **hydrocele** and **ascites**.

Lesions that need Probing: Probing should be made in **fistulas**, **fistulas with foreign bodies**, or those extending sideways.

Lesions that need Extraction: Extraction should be made in three kinds of **gravel**, **tartar on the teeth**, **wax in the ears**, **calculi**, **foreign bodies** (**missiles**), **mal-presentation of the fetus** and the **impacted feces in the rectum**.

Lesions that need Drainage :—Drainage should be performed in all kinds of (**suppurating**) **tumors** except those that develop by the derangement of the three humors (**non-suppurative tumors**), **lepromata**, **painful abscess**, **carbuncle**, **otorrhea**, **elephantiasis**, **toxic blood** (**blood in the infected region**), **furuncle**, **erysipelas**, **cysts**, three kinds of **chancres** (**hard**, **mixed**, and **soft chancres**), **breast-abscess** (or **fistula**), **suppurative bubo**, **pyorrhea**, **abscess and gummata of the palate**, **dental caries** (causing **suppuration in the gum**), **gingivitis**, **epulis**, **ulocase**, **gumboil**, **chancre of the lips**, and **pustules**.

Lesions that need Suture :—Suture

should only be made in those places which have been opened and been completely drained off (the foreign matter), or the fresh wounds near the movable joints.

Wounds that are not fit for suturation:

Sutures should not be applied to those wounds caused by caustics, cautery and toxins, or in those where there is discharge of gas, or in the interior of which there is sanies or foreign body. These should be at first disinfected ; dust, hair, nails, fragments of bone (any foreign body), when found in a wound, should be removed before sutures are applied, as otherwise they are likely to provoke suppuration and pain. Therefore they should at first be disinfected. The lips of the wound then should be raised and placed in proper apposition, and sutures applied slowly with the fine cotton thread, or the bark-fiber of *Caesalpinia digynia*, flax, catgut (*snāyu* = tendon), hair (horse hair), fibers of *Sansevieria zeylanica*, or *Tinospora cordifolia*, in any of these sutures, (1) Twisted suture (*vellitaka*), (2) Quilled suture (*gophnikā*), (3) Continuous suture (*tunna-sevanī*), (4) Interrupted suture (*rju-granthi*) or any other kind best suited to the requirement, and after the suturation is over, the sewed parts should be gently pressed by the finger and levelled. In

parts of the body covered with little flesh, or over joints, a full-curved suture needle, of two fingers' width long, should be used. For fleshy parts, a straight, three-edged, suture-needle, three fingers' breadth long, is proper. In the vital parts, scrotum and the abdomen, a half-curved suture-needle (curved like a bow) is good. These three varieties of needles should be sharp-pointed, their body rounded like the flower-stalk of *Aganosma cargophyllatum*, and should be capable of easy handling. Sutures should not be made either too far off or too close to the edges of the wound. In the former case, lips of the wound will become painful, and in the latter case, they may be torn off. Then the stitched part should be covered with cotton (as a surgical dressing) or linen (as a lint), and a powder compound of *Aglaia roxburghii*, antimony sulphide, *Glycerrhiza glabra*, and *Symplocos racemosa*, or the powder of *Boswellia serrata* or the ashes of burnt linen, should be sprinkled over it (as antiseptis). Then after proper bandaging, the patient shall be told the hygienic rules, he will have to observe." *Suśruta* I. 25. 2-12¹⁹¹.

198. द्वेया भगवन्दा यन्विः शैमिकसिलकालकः ।

ब्रह्मवर्माभुदान्दर्शवर्माकीर्त्तिसिन्धुसंगम् ॥

Caustics :—“For particular purposes, of all sharp or accessory instruments, caustics are the

शल्यं जतुमणिमांससङ्घातो गलघृष्टिका ।
 कायुमांससिराकोथो वक्त्रोक्तं शतपीनकः ।
 अभ्रुपथोपदंशाश्च मांसकन्दधिमांसकः ॥ २
 भेदा विद्रवयोऽन्यत् सर्वजाद् यन्थयस्त्रयः ।
 आदितो ये विसर्पाश्च हृद्यः सविदारिकाः ॥
 प्रमेहपिङ्गकाशोक-क्षनरोगावमग्नकाः ।
 कुम्भीकानुशयीनाथो हन्दी पुष्करिकाखनी ॥
 प्रायशः क्षुद्ररोगाश्च पुष्प टी तालुदन्तनी ।
 तुष्टिकीरी गिलायुश्च पूर्व्यं ये च प्रपाकिणः ।
 वलिसधाम्मरीहेतोर्भेदोजो ये च केचन ॥ ३
 लेख्याश्चतस्रो रोगिण्यः किलासन पजिह्विका ।
 भेदोजो दन्तवैदर्भो यन्त्रिवर्त्ताधिजिह्विका ॥
 अर्शासि मण्डलं मांस-कन्दो मांसोन्नतिकाया ॥ ४
 वेध्याः शिरा बहुविधा मूत्रहृद्दिक्कोदरम् ॥ ५
 एथा नाभ्यः सशल्याश्च त्रया उन्मार्गिणश्च ये ॥ ६
 आह्वार्याः शर्करास्तिको दन्तकर्णमलाश्मरी ।
 शल्यानि मूदगभांश्च वर्चय निश्चितं गुदे ॥ ७
 ताम्बा विद्रवयः पञ्च भवेयुः सर्वजाहते ।
 कुष्ठानि वायुः सखजः शोफो यश्च कदम्बजः ॥
 पाल्यामयाः शीपदानि विषजुष्टश्च शोणितम् ।
 अर्बुदानि विसर्पाश्च यन्थयश्चादितस्तु ये ॥
 त्रयस्त्रयत्रोपदंशाः क्षनरोगा विदारिका ।
 शीघ्रिरो गलघ्रातकं कण्टकाः क्षान्तिदन्तकः ॥

best (when alkalies in concentrated form (caustics) are brought into contact with the animal

दन्तवैटः सोपकुशः शीतादी दन्तपुष्प टः ।
 पितासक्तफणाशीभ्याः सुद्रोगाश्च भूयशः ॥ ८
 सीम्ना मीदःसन्त्यास भिन्नाः सुलिखिता गदाः ।
 सद्योव्रणाय ये चैव चलसन्धिव्याधिताः ॥ ९
 न चाराध्रिवैकुण्ठा न वा माणतवाङ्मनः ।
 नान्तर्लोहितशय्याश्च तेषु सव्यग्विशोधनम् ।
 पांशुरोमनखादीनि चलमस्थि भवेच्च यत् ॥
 अङ्गतानि यतोऽमूनि पाचयेयुर्भृशं व्रणम् ॥
 वज्रस्य विविधाः कुर्युःक्षणादितान् निशोधयेत् ॥ १०
 ततो व्रणं समुन्नम्य स्नापयित्वा यथास्थितम् ।
 सीव्येत् सूत्रेण सूत्रेण वस्त्रेणाग्रमनकस्य वा ॥
 शयनशौमसूत्राभ्यां स्नायुः । वासिन वा पुनः ।
 मूर्ध्नागुच्छीतानैवां सीव्येद्देहितकं शनैः ॥
 सीव्येद्दशोफणिकां चापि सीव्येद्वा तुलसेवनीम् ।
 कृणु यन्त्रिमयो चापि यथायोगमयापि वा ॥
 देशेऽल्पमांसं सन्धी च सूत्रो हृत्पाङ्गुलद्वयम् ।
 आयता व्यङ्गुला व्यङ्गा मांसले चापि पूजिता ॥
 धनुर्व्यूहा हिता मर्त्य-फलकोषोदरोपरि ।
 इत्येतास्त्रिविधाः सूचीसीम्नायाः सुसमाहिताः ॥
 कारयेन्मासतोपुष्प-हन्तायपरिमखलाः ।
 नातिदूरे निरुद्धे वा सूचीं कर्णेषु पातयेत् ।
 दूराद्गुत्रो व्रणोऽप्यस्य सज्जिह्वेऽवहन्मनम् ॥ ११
 अथ शीमपिपुच्छत्रं संस्मृतं प्रतिसारयेत् ।
 त्रिवक्त्र-कनकव्याह-रोव्रणैः समन्ततः

tissues, they enter into chemical combination with the oxygen present, and thus give rise to an active necrosis or destructive inflammation ; alkalies are likewise solvents of albumin ; these physical and chemical properties render the caustic alkalies active in producing counter-irritation, and their escharotic effects have been made use of in the destruction of morbid tissue, whether of neoplastic or inflammatory origin, and chronic synovitis). Due to the escharotic property of the (concentrated) alkalies, they are called caustics (*kṣāra*). They are acrid, irritant, pungent, (and their external use causes) destruction of the tissues (eschars), corrosion, disinfection, granulation, desiccation, hemostatis, scarification, (and their internal administration cures), intestinal worms, hyperacidity, eructation, cutaneous lesions, auto-intoxication ; but their excessive use induces impotence.

Alkalies are of two kinds (concentrated which is strong, and non-concentrated which is mild), for external application (strong) and for internal administration (mild). Their external application

गन्धकीफलचूर्णैर्वा क्षीमध्यासेन वा पुनः ।

ततो ब्रह्म यथायोगं ब्रह्माचारिकमादिशेत् ॥ १२

सुसुतसंहिता, सुसूत्रागम, २५

is indicated in lepromes, keloid, ringworm, leucoderma, psoriasis guttata, fistula-in-ano, tumors, indolent ulcers, fistula, condyloma, mole, impetigo, lichen planus, warts, external sores, dermatophyte, poison-bites, and gummata ; besides these, the application of caustics in seven kinds of mouth diseases (tumor of the tongue, stomatitis ulcerosa, chancres of the lips and the tongue, etc.) and three kinds of thro'at-neoplasms, is appropriate. Internally alkalies may be administered in auto-intoxication, adenitis, tympanites, indigestion, dyspepsia, anorexia, constipation, gravel, calculus, abdominal tumors, intestinal worms, poisoning and gummata. However its (internal) use is counter-indicated in persons who have a tendency to hemorrhage, biliousness, in children, the aged or weak persons, or those who are suffering from giddiness, delirium, epilepsy and amaurosis." *Susruta* I. 11. 2-5^{198a}.

198 (a). शस्त्रानुशस्त्रेभ्यः चारः प्रधानतमश्चेद्य-मेद्य-लेख्य-करणात् वि-
रोधकत्वादिभिरुक्त्यावचारवाच ॥ १

तत्र चरणात् चणनाया चारः । नानीवधिसनवायात् विदोषन्नः, शुक्लत्वात्
सौम्यत्वात् सौम्यस्यापि सतो दहनपचनदारणादिशक्तिरविश्रद्धा, स खल्लाघेयौवधिमण-
श्रूयिष्ठत्वात् कटुकं लघ्वसौख्यः पाचनो विलयनः शोधनो रोपणः शोषणः सन्धनो
श्लेष्मनः क्षिप्पानकफकुष्ठविषमिदसामुपहन्ता पुंस्त्वञ्च चातिसेवितः ॥ १

स विविधः प्रतिसारणीयः पानीयश्च । तत्र प्रतिसारणीयः कुष्ठकिटिनदद्रुक्लिबास-

Cautery : "Cautery is more potent in its action than caustics.. For once cauterized, lesions lose their sepsis, and even those which defy the medicinal, operative and caustic treatments, become hereby amenable." *Sūsruta* I. 12. 2¹⁹⁹.

Leeches : "By leeches (*Hirudo*), bleeding (or removal of congestion) can be accomplished in the easiest way of kings, wealthy personages, women, children, the aged, timid, weak or delicately constituted individuals." *Sūsruta* I. 13. 2.²⁰⁰.

Enema : "As enema (*vasti*) serves multifarious purposes, according to the medical experts,

मण्डलभगन्दराय्युदुष्टमृगनाडीचर्मकोलतिल-कालक - मण्डलवाद्यविद्रधि -
क्रिमिविचार्यःसु उपदिश्यते सप्तसु च मुखरोगेषु प्रजिह्वोपकुशदन्तवैभेषु तिलसु च
रोहिणीवैतेषु चैवानुबलप्रविधानमुक्तम् । पानीयसु गरुडोदराग्निसङ्गाजीर्णरो-
चकानाह मर्कटाश्रम्याभ्यन्तरविद्रधिक्रिमिविचार्यःसुपयुज्यते ॥ ४

चङ्कितसु रक्तपित्तज्वरितपित्तप्रकृतिवालुडदुर्बलजनमदसूक्ष्मातिमिरपरीतिभ्योऽभ्य-
चैर्बन्धिष्येभ्यः । तच्च तरवारवह्मणा परिचाययेत् । तस्य विहारोऽन्यत्र ॥ ५

सुसुतसंज्ञिता, सूक्ष्मजनम्, ११ ।

199. चारादभिर्गतेष्वानु क्रियासु व्याख्यातः । तद्विधानं रोगजनानुक्रमिक-
वैकल्यजनचारैरसाध्यानां तद्व्याख्यातः ॥ २

सुसुतसंज्ञिता, सूक्ष्मजनम्, ११ ।

200. वृषाद्यावाद्यस्त्रनिर्भोषदुर्बलनारोसु कुमाराचामनुग्रहायै परमसु कुकरोऽयं
श्लोचितवसेचनीपायोऽभिद्रिष्टो जलीकृतः ॥ २

संज्ञितसंज्ञिता, सूक्ष्मजनम्, ११ ।

it is the best of all analeptic (*sneha*) remedies. If it be properly applied, it makes the weak strong (Stimulating enema), the lean stout (enema nutriens), the stout lean (enema purgans), strengthens eye-sight (by removing the decomposing materials from the intestine, the toxic products of which are absorbed in the system, and provoke reflexably various maladies) and prolongs youthfulness. It promotes the general health of the body, adds to its vigor, brightens complexion, is a restorative of health and conduces to the longevity of life ; and its use in fever (enema purgans), diarrhoea (enema adstringens), amaurosis, catarrh, cephalalgia, ophthalmia, hemiprosoplegia, mimic convulsion, apoplexy, general paresis, tympanites, hemiplegia, flatulence, gravel, hyperalgia, oschitis, syphilis, constipation, strangury, bubo, hemorrhage, hydrothionuria, fecal impaction, aspermia, menostasia, galactozemia, cardipalmus, lockjaw, torticollis, piles, calculus and abortion, is appropriate.

Fountain-syringe : For a boy one year old the tube (*netra*) shall be six fingers' breadth long, having the dimension of the little finger, and at the extremity of which, the nozzle (*karnikā*) should be fixed, one and a half fingers'

breadth long ; the orifice at the mouth of the tube should be like that of a heron's feather, and at the end, like *Phaseolus mungo*. For a boy of eight years of age, the tube shall be eight fingers breadth long having the dimension of the ring-finger, and at the extremity of it, the nozzle should be fixed two fingers' breadth long ; the orifice at the mouth of the tube shall be like the feather of the vulture, and at the end like *Phaseolus radiatum*. And for a person, sixteen years old, the tube shall be ten fingers' breadth long, having the dimension of the middle finger, and at the extremity of it, the nozzle should be three and a half fingers' breadth long ; the orifice at the mouth of the tube shall be like the peacock's feather, and at the end like that of a pea. The reservoir (*āsthāpana*) for the enema, for persons, one, eight or sixteen years of age shall be the size of their two handfuls, four handfuls, and eight handfuls of their individual hands respectively (the modern fountain-syringe is an apparatus, consisting of a rubber reservoir for holding fluid for the enema, to the bottom of which is attached a rubber tube, provided with a suitable nozzle, usually made of vulcanized rubber ; and it is used for rectal or vaginal injections, irrigating wounds, etc., the

force of the flow being regulated by the height of the reservoir above the point of discharge).

The size of the tube and the reservoir is not only to be graduated according to the age (of the patient), but also in addition to it, his physical condition and vigor.

For a person, above twenty five years of age, the tube shall be twelve fingers' breadth long, having the dimension at the mouth like the thumb, and at the end like the little finger, and the nozzle shall be three fingers' breadth long ; the orifice of the tube at the mouth should be like the feather of a female vulture, and at the end like the stone of plum. The tube should be firmly fixed with the reservoir. And the reservoir should be capable of holding twelve handfuls of enema. After seventy, the tube shall remain just the same, but the quantity of the enema should be reduced to that of a person of sixteen years of age.

The tube should be made of gold, silver, copper, bronze, ivory. horn, glass or wood, polished, strong, shaped like the bovine tail with gradually reducing dimension, straight and with globular orifice. And the reservoir is made out of the bladder of the matured cow, buffalo, boar, goat or sheep, and it should be flexible, even

strong and of the required size." *Sūtrata* IV. 35. 2-7²⁰¹.

201. तत्र खेदादोनां कर्षणां वक्तिकर्षं प्रधानतममाधुराचार्याः । कक्षात् ? अनेककर्षकरत्वादसौः । इहवस्तिर्नामाविधद्रव्यसंयोगाद्दोषाणां संशोधनसंशमन-संयङ्ग्यानि करोति, चापयुक्तं वाजो करोति, कृशं वृद्धयति, स्थूलं कर्षयति, चक्षुः प्रोषयति, वलौपक्षितमुपहन्ति, वयः स्थापयति । शरीरोपचयं वर्षवलमारोग्य-मायुषः परिहृद्भिश्च करोति वस्तिः सम्यगुपासितः ; तथा ज्वरातीसार-तिमिरप्रतिष्ठाप-शिरोरीगाधिगन्धाद्भिः ताक्षेपकपक्षाघातैकाङ्ग-सर्वाङ्गरागाग्नाग्नीदर-शर्कराशूल-उद्ध्वुप-दंशानाङ्गमूलकण्ड-गुल्फ-वातशोणित-वातमूलपुरोषोदावर्त्त-युक्तार्त्तव-सन्ध-नाशङ्कतुमन्वा-यङ्गार्शोऽम्भरोमूदगर्भप्रभृतिषु चान्यथंमुपयुज्यते ॥ २

वक्तिर्वति च पिप्ते च कफे रक्ते च शक्यते ।

संसर्गे सन्निपाते च वक्तिरेव हितः सदा ॥ ३

तत्र सांवत्सरिकाष्टद्विरष्टवर्षाणां षडष्टदशाङ्गुलप्रमाणाणि कनिष्ठिकानामिका-मध्यमाङ्गुलि-परिणाङ्गान्यथेऽध्यर्द्धाङ्गुल-द्व्याङ्गुलार्ध-तृतीयाङ्गुलसन्निविटकर्षिकानि कक्ष-प्रयेनवर्द्धिपवनाङ्गीतुल्यप्रवेशानि सुद्विमाषकलायमानकोतांसि विदध्यान्नेत्राणि । तेषु त्वास्यापनद्रव्यप्रमाणमातुरङ्गसंश्लिष्टेन प्रसृतेन सन्निपती प्रसृती चैव त्वाराऽष्टी विधेयाः ॥ ४

वर्षोत्तरेषु नेत्राणां वस्तिमानस्य चैव हि ।

वयोवलशरीराणि समीक्ष्य वर्षेयेदिधिम ॥ ५

पञ्चविंशतेरुहं षादशाङ्गुलं मूलेऽङ्गुलीदरपरिणाङ्गनये कनिष्ठिकोदरपरिणाङ्ग-नये त्र्यङ्गुलसन्निविटकर्षिकं षट्प्रपवनाङ्गीतुल्यप्रवेशं कोलास्थिमानं द्विदं, त्रिद्व-कलायमानं द्विदमित्येके । सर्वाणि मूले वस्तिनिवन्धनार्थं द्विकर्षिकानि । चास्यापनद्रव्यप्रमाणानु विहिता षादश प्रसृताः । सप्ततेरुहं नेत्रप्रमाणादितदीय, द्रव्यप्रमाणानु द्विरष्टवर्षयत् ॥ ६

तत्र नेत्राणि सुवर्णरजसताम्राद्योरीतिदन्तवर्णनक्षितवसारनवाणि त्र्यङ्गानि षड्गानि

Fractures : "One suffering from fractures, should avoid salt (sodium chloride), pungents, alkalies, acids, sexual indulgence, exposure to the sun, exercise and desiccant food. He should take cooked fine rice, meat-broth, milk, milk-fat, pea soup, and stimulative foods and drinks. The bark of *Glycyrrhiza glabra*, *Ficus glomerata*, *Ficus religiosa*, *Butea frondosa*, *Terminalia arjuna*, *Bambusae*, *Shorea robusta* and *Ficus indica* for splint (*kuśa*). For liniment, *Rubra manjista*, *Glycyrrhiza glabra*, *Pterocarpum santalinum*, and buttered rice-paste which has been repeatedly washed in water (that is fat has been washed out from the surface of the rice paste) should be used. The wound should be bandaged every seventh day in the wintry season, every fifth day in the temperate season, every third day in the hot weather, or according to the urgency of the needs. But if the bandage (splint) is loose, reparation of the joints does not take place, and if too tight, it is apt to cause inflammation of the tissues, pain and suppuration ; therefore

गोपुष्पाङ्गतीक्ष्णं नि श्रुटिकामुखाणि । वलयबाह्वानां चन्द्रो नातिवह्ना इदाः
प्रलाभक्यो गोलहिवनद्याङ्गोरधायान् ॥ ७

सुश्रुतसंहिता, चिकित्सितस्थानम्, २५।

it should be properly bandaged (The reparation of the bone in fractures depends on two factors : (1) The fragments of the fractured bone are to be placed in apposition to one another in the normal position, and kept in that condition from a week to eight weeks, according to the needs of the case, so that the bone can be repaired and consolidated. (2) The reparation principally takes place in the soft tissues surrounding the bone, and from the torn periosteum granulation tissue is formed, which when calcified forms callus and which by ossification is converted into bony structure ; therefore if the splint has been put on before the bones have been properly set, or if the bandage is loose, or due to movement, the fragments change their place, then of course reparation can not take place, and after three months time, they lose their recuperative power ; if on the other hand, the fragments of the bones are very rigidly fixed, face to face, without leaving any space between them, and the bandage is very tight, there will be then minimum of callus formation. Therefore for successful reparation, both these extremes are to be avoided, and this can be only faithfully determined by X-ray examination. In children

normally, the reparation is rapid, especially in cancellous tissues)." *Suśruta* IV. 3. 2-8¹⁰².

Fractures of the Phalanges or dislocation of the Metacarpo-Phalangeal joints : "Whether the phalanges are fractured or the joints are dislocated, they should be placed in the normal apposition and bandaged (Wyeth's finger-bandage or roller-bandage), and upon it (vulnerary) butter should be applied.

Metatarsal fractures : In the fractures of

202. लवणं कटुकं चारमकं मैथुनमातपम् ।
 व्यायामश्च न सेवेत भग्नौ चक्षामनेव च ॥ ७
 शालिर्नासरसः क्षीरं सपिष्टं च सतीगलः ।
 मृद्वश्चापानं स्याद्देयं भग्राय जानता ॥ ८
 मधुकोटुम्बरान्त्व-पलाशककुभत्वचः ।
 वंशसर्ज्वटानां वा कुमार्थमुपसंहरित् ॥ ९
 आलेपनार्थं मञ्जिष्ठा मधुकं रक्तचन्दनम् ।
 शतधीतघृतोन्मिश्रं शालिपिट्तञ्च संहरित् ॥ १०
 सम्राडादयः सम्राडात् सीयिष्वृतुषु बन्धनम् ।
 साधारणेषु कर्त्तव्यं पञ्चमे पञ्चमेऽङ्गनि ।
 चाग्नेयेषु त्यक्त्वात् कुर्याद्भग्नदोषवशेन वा ॥ ११
 तवातिशयिलं बद्धे सन्धिसंस्थैः न जायते ।
 गादेनापि त्वगादीनां शोको बह्वपाक एव च ।
 तज्यात् साधारणं बन्धं भग्नं शंसन्ति तद्विदः ॥ १२

सुसुतसंहिता, चिकित्सित-खानम्, १ ।

the metatarsus, (vulnerary) liniment should be applied, then bandaged, and upon it splint should be placed (to prevent motion and displacement of the bones).

Fractures of fibula and femur : In fractures of the fibula (tibia) and the femur, the parts should be massaged with a liniment and the fragmented bones brought to apposition ; then after fixing a splint, they should be bandaged. If the neck of the femur project, or the fragments of the bone tear out through the flesh, it should be given a circular bandage.

Fractures of the hip-bone : In the fracture of the os innominatum (usually in the neck), the raised part of the bone should be lowered, and the depressed part raised, and thus it should be bandaged. When the hip-joint has been put in its normal place, it should be irrigated (with a vulnerary or an antiseptic).

Fractures of the Ribs : If the ribs are fractured, they are to be rubbed with a salve, and then after placing a pin (*kavalikā*), the ribs are to be fixed by 'twisted suture' (*nivandhanī*), and then bandaged ; later the patient is to be laid in an extension splint, simple (*dronī*) or filled with (vulnerary) oil (*kaṣṭhā*).

Dislocation of the scapulo-humeral joint : In the dislocation of the scapulo-humeral joint, the humerus is raised, by using a hammer at the axilla, and when the bones are in their normal apposition, affixed by the '*spica bandage for the shoulder*' (*svastika-vandhana*).

Dislocation of the Elbow-joint : If the elbow joint is dislocated, it should be massaged, and then put in the normal position through extension and flexion movements ; when it is done, it should be salved. The same treatment is applicable in the dislocation of the knee-joint, ankle-joint and radio-carpal joints (wrist-joint).

Fractures of the metacarpus : In the fractures of the metacarpus after proper bandaging, it should be moistened with a (vulnerary) oil ; then to find out the strength of reparation, it should be gradually tested by holding upon the palm of the hand, a dried cow-dung ball (very light), clay-ball, and at last a stone.

Dislocation of the acromio-clavicular joint : In the dislocation of the acromio-clavicular joint, if the (outer end of the) clavicle be displaced upwards, or downwards (from the acromion), after fomentation, it should be raised in the former case by a hammer, and in the latter case, depressed, and bandaged with a strong support

{Dessault's bandage : in obstinate cases, if the displacement persist and cause discomfort, the bones should be held together by wiring).

Fracture of the Humerus : In the fracture of the humerus, the treatment is similar to that of the femur.

Sprain of the Cervical vertebral articulations : If the neck is bent or depressed, it should be brought to apposition by pressure upon the cervical vertebræ and (with the traction-aid of) maxillary bones ; it should then be bandaged after splint, and the patient laid to bed on his back for a week.

Dislocation of the Temporo-Maxillary joint : In the dislocation of temporo-maxillary or temporo-mandibular joints, the bones should be put in proper apposition and held together by five-tailed (*pañchāṅgī*) bandage (used as four-tailed bandage now-a-days), and there should be nasal injection of errhine, made of a sedative drug-cooked in butter.

Pyorrhœa alveolaris : If in young people, the teeth become loose, associated with bleeding gum, without any external injury, it should be treated by antiseptic cold wash and injections ; and the patient shall drink milk (during the treatment) with the (tubular) stem of *Nymphaea stellata*.

In case of old men, the loose teeth should be extracted (by a forceps).

Injuries to the Nose : If the nasal bone caves in or is bent (by traumatism or syphilitic lesion), then it should be raised and straightened (by a speculum) and then for respiration, in two nasal cavities, two double-mouthed tubes should be inserted. When it is done, it is to be bandaged, and the bandage to be kept moistened by a (vulnerary) ointment.

Injuries to the Ear : If the (ossicles of the) ears are broken, they should be put in their apposition, then after an application of a (vulnerary) ointment, they should be bandaged and treated like ordinary wounds.

Injuries to the Cranium :—In the fracture of the frontal bone, if the brain matter has not come out (if the dura matter has not been penetrated or hurt), after liniment, the wound shall be bandaged, and the patient shall take clarified butter (?) for a week.

Inflammation : If due to an accidental fall or traumatism, any part of the body becomes inflamed without any (apparent) injury, it shall be treated by cold application and fomentation alternately).

Fractures of the Femur and the leg bones :

In the fractures of the leg-bones (tibia and patella) or of the thigh (femur), the patient has to be lain in wooden extension bed, and for the maintenance of the steady traction (until the consolidation of the bone has taken place, and to prevent the tension of the muscles which prevents the reparation of the fracture), the leg or the thigh has to be fixed with five nails; thus in the fracture of the leg bones, there should be two nails on each side of the leg, and against the sole, upon the wooden frame (to prevent movement, which interferes with consolidation of the fractured bones); in case of the fracture of the femur, two nails on each side of the thigh, and at the hip joint should be fixed. (This treatment in the fractures of the femur or the leg bones, is very similar to the modern practice by Hodgen's nail extension splint). This is also applicable in the fractures or dislocations of the pelvis, vertebrae and the clavicle. If the dislocation is old, this treatment is to be preceded by embrocation to soften the ligaments.

Fractures of Patella : If the fractured patella (*kāṇḍa*) has consolidated in wrong apposition, it has to be broken up (artificially) and then to begin treatment, after putting it in the normal apposition.

Amputation of a dried bone : If the flesh has retracted from a protruded bone, leaving it dry, then the bone has to be amputated (by saw) carefully up to the fleshy part, and then it has to be treated like a fresh wound (by a recurrent bandage)." *Suśruta* IV. 3. 23-42^{२०३}.

203. भग्नां व. सन्निभुक्तां वा स्थापयित्वाङ्गुलीं समम् ।
 अक्षुनावेध्य पट्टेन घृतसेके प्रदापयेत् ॥ २२ .
 अभ्यज्य सर्पिषा पादं तलमग्रं कुशीतरम् ।
 वस्त्रपट्टेन वध्नीयाग्रञ्च व्यायाममाचरेत् ॥
 अभ्यज्यायामयेज्जङ्गामूश्च सुसमाहितः ।
 दत्त्वा हृद्यत्वचः शीता वस्त्रपट्टेन वेष्टयेत् ॥ २३
 मतिमांशक्रयोगेण आण्डे दूर्लभ्ये निर्गतम् ।
 स्फुटितं पिञ्चितञ्चापि वध्नीयात् पूर्ववद्विषक ॥ २४
 आण्डे दूर्हमधो वापि कटोभग्नानु मानवम् ।
 ततः स्थानस्थिते सन्धौ वस्त्रभिः समुपाचरेत् ॥ २५
 पशुकास्त्रय भग्नानु घृताभ्यक्तस्य तिष्ठतः ।
 दक्षिणास्त्रय वा वामास्त्रगुह्यं निवन्धनीः ॥
 ततः कवलिकां दत्त्वा वेष्टयेत् सुसमाहितः ।
 तैलपूर्णं कटाहं वा द्रोण्यां वा शाययेन्नरम् ॥ २६
 मुषलेनोत्क्षिपेत् कक्षामंससन्धौ विसृजते ।
 स्थानस्थितञ्च वध्नीत स्वस्तिकेन विचक्षणः ॥ २७
 कौर्परानु तथा सन्निभङ्गुष्ठेनानुमाज्ययेत् ।
 कनुसज्य ततः सन्धिं पीडयेत् कूर्परानुगतम् ।
 प्रसार्याङ्गुलद्वयेन केद्वयेकञ्च दापयेत् ॥ २८

Rhinoplasty : The portion of the nose to be covered over, is to be measured (exactly) with a

एवं नासुनि गुरुके च मणिवन्धे च कारयेत् ॥ २८
 उभे तस्य सने कृत्वा तलभगस्य देहिनः ।
 बध्न यः दामतैलेन परिषेकाच्च कारयेत् ॥
 प्राग्गोमयमयं पिष्टं धारयेन्मुग्धयं ततः ।
 हृत्ते जातवले चापि कुर्यात् पाषाणधारणम् ॥ २९
 सग्नमुष्णमयेत् स्निग्धमचकं सुषलेन तु ।
 तथोष्णतं पीडयेच्च बध्नीयाद्वाटमिव च ॥ ३०
 कश्चपि कर्तव्यं बाहुभग्नचिकित्सितम् ॥ ३१
 शीवायानु विहस्य वां प्रविष्टायामधोऽपि च ।
 अथटावथ हृत्वीच प्रगृह्णीन्ममयेन्नरम् ।
 तथा कुशान् समं दत्त्वा वस्त्रपट्टेन वेष्टयेत् ।
 उत्तानं शाययेच्चैनं समरात्रमतन्द्रितः ॥ ३२
 हृत्स्थिनी समानीय हनुसन्धीं विच हते ।
 स्वेदयित्वा स्थिते सम्यक् पश्चाद्गौं वितरेद्विषक् ॥
 वातघ्नमधुरैः सर्पिः सिद्धं नखै च पूजितम् ॥ ३३
 अभग्नान्धलितान् दन्तान् सरज्जानवर्षयेत् ।
 तद्वत्तु मनुष्यस्य शीतैराक्षिपयेद्विहः ॥
 चिकित्सुभिस्ततः शीतैः सन्धानीयै रूपाचरेत् ।
 उत्पलस्य च नालेन शीरपाणं विधीयते ॥
 शीतस्य तु मनुष्यस्य वर्जयेच्चलितान् बिजान् ॥ ३४
 नासां सङ्गां विहतां वा कृज्जीं कृत्वा शलाकया ।
 पृथङ्नासिकयोर्नाडीं बिभृक्षी संप्रवेष्टयेत् ।
 ततः पट्टेन संवेष्ट्य हतखिर्कं मदाप्रयेत् ॥ ३५

leaf ; and a flap of the required size is to be taken from the 'ganda' (goitre or the cheek), to be grafted there, and to support it a metallic frame is to be inserted with two tubes in the nostrils to hold it in position, and then scraping the border (to which the grafting is to be joined),

अथ पार्श्वं वक्षीयात् समं कृत्वा घृतद्रुतम् ।

सद्यःचतविधानञ्च ततः पश्चात् समाचरेत् ॥ ३७

मस्तुलुङ्गादिना भिम्ने कपालि मधुसर्पिणी ।

दक्ष्णा ततो निवर्त्तय्यात् सम्राट् पिवेद्घृतम् ॥ ३८

पतनादभिघाताद्वा यूनमङ्गं यद्व्यतम् ।

श्रीतान् प्रदेहान् सीकाञ्च भिषक् तस्याजचारयेत् ॥ ३९

अथ अङ्गुलीभ्रमणानां कपाटग्रयनं हितम् ।

कौलका बन्धनार्थञ्च पञ्च कार्या विज्ञानता ॥

यथा न चलनं तस्य भ्रमस्य क्रियते तथा ।

सम्बन्धयतो दोषी तस्य चैकाग्र्यं कौलकः ॥

श्रीष्ठा वा घृतवर्गं वा ब्रह्मस्यचकयीशया ।

भ्रमसन्धिबिन्दोषेषु विधिनिर्णयं समाचरेत् ॥

सन्धौत्रिचरविमुक्तास्तु खिग्धान् स्निग्धान् सृङ्गकान् ।

सर्पं विचारे बुद्ध्या च सध्वक् प्रकृतिमानयेत् ॥ ४०

काष्ठभस्मे प्रहर्दे तु विषतोत्पणसंहति ।

कापोष्थं घनयेद्भ्रमं ततो भ्रमवदाचरेत् ॥ ४१

कल्पयेन्निर्गतं शुष्कं त्रयान् स्थिः समाहितः ।

सन्ध्वनी वा क्रियां कुर्यात् सत्रस्यै त्रयभ्रमवत् ॥ ४२

सुसुतसंहिता, चिकित्सितखानम्, ३ ।

and making the surface fresh (to make the grafting successful), the flap is to be carefully sutured. When the grafting has been properly made, a powder made out of *Ptercarpus santalinus*, *Glycyrrhiza glabra* and sulphate of antimony should be sprinkled over the part, and then it should be covered with a lint, which is to be kept moistened with oleum Sesamum (until the complete grafting has taken place. The modern method of rhinoplasty is almost the same, except the two tubes inserted in the nostrils; to hold the metallic frame in position, the metallic frame is made to fit tight the scraped pocket in the nasal bone, and it is provided with a few nodules which are inserted into the nasal bony frame. As to the grafting, the English method consists in taking a flap from the cheek, as devised by Syme, who borrowed it from India; the Italian and the German methods consist of taking the flap from the arm; in osteoplastic rhinoplasty, there is a transplantation of a cartilaginous flap to replace the septum nasi. The very recent method in nasal prosthesis consists of subcutaneous injection of a mixture of solid and liquid paraffin, as introduced by Gersuny in 1910. But as it might partially melt in the body temperature, and thus emigrate and provoke embolism, it has

been improved upon by Eckstein who uses pure paraffin, which melts only at 60 degree centigrade and solidifies after injection, which can be easily performed by Brockaert or Lermoyer's syringe. This has given very satisfactory results). *Susruta* I, 16. 23²⁰⁴.

204. नासाग्रमाद्यं पृथिवीवद्भाषां पथं गृहीत्वा त्वलम्बितस्य ॥
 तेन प्रमासेन हि गच्छपार्श्वोदुत्कृत्य बहुन्वथ नासिकाग्रम् ।
 विलिख्य चाथ प्रतिसन्दधीत तत् साधुवन्धैर्भिषगप्रमत्तः ॥ •
 सुसंक्षिप्तं सम्पद्यो यथावन्नाडीद्वयेनाभिसमोदय वहा ।
 प्रोन्नम्य चैनामवचूषयेच्च पराङ्मण्डोमधुकाञ्चनेन च ॥
 सञ्जाय सम्पक् पिशुना सितेन तैलेन सिञ्चिदसक्तत्तिष्ठानाम् ।

सुसुतसंक्षिप्ता, स्वस्वाग्रज, १६ ।

VIII. DIETETICS.

“It is apparent that food and drink act as fuel, in the process of metabolism. Vital process is sustained when metabolism is fed by this fuel. Proper dietary nourishes all the bodily elements, improves complexion and enlivens the senses. On the other hand improper dietary provokes disease.” *Charaka I. 27. 2⁰⁵*.

“Vigor, health, longevity and life itself is based on oxidation. Food and drink increase and balance the oxidizing process.” *Charaka I. 27. 165²⁰⁶*.

“The physician that does not know the principles of ‘Dietetics’, can not cure diseases.” *Susruta I. 46. 3²⁰⁷*.

205. प्रत्यक्षफलदर्शनात् तदित्यनात् स्थानरप्तेः स्थितिः । तत् सत्तमूर्त्ययति, तच्छरीरधातुव्यवस्थलवर्णेन्द्रियप्रसादकरम् यद्योक्तमुपसेव्यमानं । विपरीतनङ्किताय सव्ययते ।

चरक-संहिता, सूत्रस्थानम्, २७ ।

206. बलमारोग्यमायुश्च प्राणाश्चाद्यो प्रतिष्ठिताः ।

अग्निपानेन्वर्गश्चाग्निदीप्यते शाल्यतेऽन्वया ।

चरक-संहिता, सूत्रस्थानम्, २७ ।

207. नञ्जनवपुस्तत्त्वमात्रा भिन्नः सस्यागुणं रोगनिवृत्त्यर्थं कर्तुं समर्थाः ॥

सुश्रुत-संहिता, सूत्रस्थानम्, ४६ B

“Every organic body contains five substances as (1) Minerals and Nitrogenous compounds (*prthivi*), (2) Water (*ap*), (3) Hydro-carbons (*tejas*), (4) Carbo-hydrates (*vāyu*) and (5) Ethers (*ākāśa*); but it may be called ‘*pārthiva*, *āpyu*, *taijasa*, *vūyavya* or *ākāśīya* according to the predominance of the substance contained in it.

Minerals and Nitrogenous Compounds (protein) : The substance that is gross (*sthūla*), dense (*sāra*), has a high specific gravity (*sāndra*), non-pungent (*manda*), inert (*sthira*), rough (*khara* = sharp-edged crystals by the different inclination of their axes), heavy (*guru*), hard (*kāṭhina*), odorous (*gandhavahula* = extractive substances of the meat-protein), slightly astringent (*iṣat kaṣāya*) and sweetish (*madhura*), is ‘*pārthiva*’ (organic mineral bodies, and protein which contains about 16 p.c. of nitrogen). This produces firmness (of the bony structure by the minerals), physical vigor (by protein), hardness (of the bony structure by the minerals) muscular tissue-growth (by protein), and particularly it has a high specific gravity.

Aquatic substance : The substance that is cool (*śīta*), moistening (*stimila*), soft (*snigdha*), liquid (*manda*), heavy (*guru*), fluidic (*sara*), dense (*sāndra*), smooth (*mṛdu*), viscous (*picchhila*), savo-

ry (*rasa-vahula*), slightly astringent, acid or saline (*kaṣāya-amla-lavaṇa*) and sweetish (*madhura*), is *āpya*' (juice of vegetable or meat). It is fattening, refreshing, moistening, adhesive (by nature), and excretory (diuretic or sudorific in action).

Hydrocarbons : The substance that is calorific (*uṣṇa*), penetrative (*tikṣṇa*), fine-textured (*sūkṣma*), desiccant (*rukṣa*), escharotic (*kharā*), light (*laghu*, in molecular weight), transparent (*viśada*, particularly liquid oil, having forms and containing active principles (*rūpaguṇavahula*), slightly acid and saline (*iṣad amla-lavaṇa*) and pungent (*kaṭu-rasa*), is '*tejasa*' (hydrocarbon, that is fatty bodies which generate heat. It is very likely that the pungent spices were also regarded calorific, as the congestive phenomenon with its concomittant redness, heat and the burning sensation, provoked by its excessive uses, was mistaken for calorific energy). It causes combustion (oxidation), digestion, cleavage (of the food particles in the alimentary tube), heat, radiation (of heat), round face (corpulency) and bright complexion.

Carbohydrates : The substance that is fine, desiccant, rough (in tactile sensation, by different inclinations of the axes as in sugar crystals),

crystalline, tactile, slightly bitter (?), and astringent, is 'vāyavya' (energy-producers, that is carbohydrates). It causes corpulence, agility (muscular energy), relaxation, desiccation (by external application), and motion (as manifestation of muscular energy).

Ethers : The substance that is tenuous, rarefied, non-resistant (when a body passes through it), diffusive (a solid body has both size and shape ; a liquid body takes the shape of the vessel in which it is kept : therefore it lacks shape, but quantitatively it does not lack size : but a gaseous body has neither size nor shape, as it diffuses itself in the surrounding atmosphere, if it be not confined in a closed container), transparent, made of diffused particles, tasteless, and soniferous, is 'ākāśīya' (ethers, volatile oils and gas). It causes pliancy, distension and lightness." *Suśruta* I. 41.2-7²⁰¹.

208. तत्र पृथिव्यग्नेजीवायुः। कामानां समुदायाद् द्रव्याभिनित्युत्पिबत्त्वात् स्वमिव्यक्तो भवतीदं पार्थिवमिदमाप्यमिदं तैजसमिदं वायव्यमिदमाकाशीयमिति ॥ २

तत् स्थूलसारसाम्प्रमन्दस्त्रिरस्त्ररगुणकठिनं गन्धबहुलमीषत्वावायुं प्रायशो मधुरमिति पार्थिवम् । तत् स्वेय्यबलसंघातोपचयकरं विशेषतश्चाधोगतिसम्भावमिति ॥ ३

जीत-स्त्रिमित - स्त्रिर - मन्द - गुहसरसाम्प्रमन्दुपि - स्त्रिरसबहुलमीषत्वावायुः कलवचं मधुररसप्रायमाप्यम् । तत् खेडनप्रदादनक्रेदनवन्धनविषन्दनकरमिति ॥ ४

लघु-दीप्त-सूक्ष्मवचस्त्ररगुणविमदं रूपगुणबहुलमीषदकलवचं कटुकरसमायुं विने-

I.—Carbohydrates.

Rice : "The autumnal rice (*Oryza sativa*) is sweetish, produces energy without (much) heat (a gram of carbohydrate or protein produces 4.1 Calories, while a gram of fat liberates 9.3 Calories), easily digestible, strengthening (dynamogenesis is due to glycogen, which can be most economically produced in the human system by the carbohydrate portion of the diet, and for glycogenesis, carbohydrate in one form or another is the staple indispensable food of almost all the human beings, except a few Eskimoes who mostly live on seal-meat and fat, and the primitive Indians of Tierra del Fuego who mainly subsist on shell fish and hunting), sedative, causes slight flatulence (in case of fermentation), fattening (excess of glycogen, produced by the habitual consumption of

यत्तच्छीर्षं मतिस्त्रावावमिति तैजसम् । तद्दृष्टमपचनदारण्यतापनप्रकाशनप्रभावार्थं कर-
मिति ॥ ५

सूक्ष्मसूक्ष्मरश्मिश्चिरसुविशदं स्यर्धबहुलमीवसिक्तं विशिष्यतः कषायमिति त्रयधीयम् ।
तर्धं यद्यन्नाद्यवन्मदमविकचवविचारवकारमिति ॥ ६

सूक्ष्मसूक्ष्मदुग्धवायुविकचविशिष्यविज्ञानव्यतरसं शब्दबहुलमाकाशीयम् । तन्नाहं व-
शोविधीलाचवकारमिति ॥ ७

carbohydrate more than the bodily requirement, is at first deposited in the hepatic and the muscle cells; but if it be not used, it is converted into adipose tissues, as a stored energy in case of future needs), is constipative, and leaves very little residue (rice is poor in cellulose; husked rice contains about 12.0 water, 7.12 protein, 1.0 fat, 76.8 carbohydrates, 1.0 cellulose and 1.0 p. c. minerals)." *Susruta* I. 46. 6⁰⁰.

"*Barley*: Barley (*Hordeum distichon*) is astringent-sweetish, produces energy without much heat generation, acidifying (by fermentation), removes '*kapha* and '*pitta*', acts as vulnerary like the sesame (oil) and in abscesses (by external application), a daily food, diminishes urinary secretion (oliguria), produces flatulence (in fermentation), laxative having a large residue (3.8 cellulose), promotes longevity, enhances metabolism, improves memory, voice and complexion, viscous (when barley powder is dissolved or cooked in water), reduces corpulency, adiposis (by increased metabolism),

209. मधुरा वाय्वितः शोणितो लघुनासा यत्नावहः ।

पित्तत्रास्यनिष्ठकफो क्षिप्तो यत्नावहश्चः ॥ ६

सुसुप्त-क-क्षिता, सुतन्त्रात्मनः, ४६ ।

refrigerent (when drunk internally as a decoction), desiccant (by external application) and is a purifier of blood and of bilious secretion (barley contains about 12. 3 p. c. water, 10. 1 protein, 1. 9 fat, 3. 8 cellulose, 2. 4 mineral matter)." *Suśruta* I. 46. 40²¹⁰.

Wheat : Wheat (*Triticum sativum*) is sweetish, heavy to digest (when not properly cooked), energizing, promotes vigor, aphrodisiac, appetizing, fattening, produces energy without much heat generation, sedative, vulnerary in fractures, diuretic and laxative (wheat contains about 12. 0 p. c. water, 11. 0 protein, 1. 7 fat, 71. 2 carbohydrates, 2. 2 cellulose and 1. 9 mineral matter.)" *Suśruta* I. 46. 42²¹¹.

210.

यवः कषायो मधुरो हिमश्च

कटविपाकी कफपित्तहारी ।

ब्रणेषु पथ्यक्षिलवच्च नित्यं

प्रवक्ष्यन्मूत्रो बहुवातवर्धः ॥

स्थैर्योग्निनिधाम्स्वरवर्धं ह्यथ

स पिच्छिलः स्थूलविक्षिप्तनश्च

नेदीमहत्तृक् दूरणोऽतिवचः

प्रसादनः शोषितपित्तयोश्च ॥ ४०

सुसुप्त-स हिता, स्वस्नानम्, ४६ ।

211.

गोधूम उन्नो मधुरो शुद्धश्च

वल्गुः क्षिरः शुक्रवर्धप्रदश्च ।

II.—*Legumes.*

Legumes : “Phaseolus mungo (*mudga*), Phaseolus lobatus (*vana-mudga*), Pisum sativum (*kalāya*), Phaseolus aconitifolius (*makusṭa*), Ervum lens (*masūra*), Cicer lens (*maṅgalya*), Cicer arietinum (*chaṇaka*), Pisum arvense (*satina*), Convolvulus turpethum album (*tripuṭa*), Lathyrus sylvestris (*hareṇu*), Cajan cajan (*udakī*). etc. are the legumes. They are astringent-sweetish, energizing without production of heat, acidifying (in fermentation), productive of flatulence, constipation and oliguria (Legumes hold an intermediate place between carbohydrates and proteids, having nearly 18 to 25 p. c. of vegetable protein—legumin, (soy bean of Soia soja has about 32.9 p. c. of protein, 18.1 of fat, 28.7 of carbohydrates, 4.9 of minerals), half to one and half per cent of fat, 50 to 60 p. c. of carbohydrates. But unfortunately much of this rich food contents can not be absorbed, as they are confined in the cellulose, and the human stomach lacks sufficient enzymic potency to

बिम्बोऽतिशीतोऽनिलपित्तहृन्ना

सन्धानज्ञत् ज्ञेयकारः सरस्व ॥ ४२

सुश्रुत-संहिता, सूच्यमाण ; ४६ ।

burst open the cellulose shell. However, if it be taken in the pure form, enough of it can be assimilated to make it a valuable addition to the dietary)." *Suśruta* I. 46. 25-26²¹².

III.—*Proteids.*

Meat : Meat can be had from six classes of animals — (1) Aquatic (*jaleśaya*), (2) Marshy (*ānūpā*), (3) Domesticated (*grāmya*). (4) Carnivorous (*kravyāda*), (5) Perissodactyla (*ekaśapha*, distinguished from arisodactyla), and (6) Wild (*jāṅgala*). (Meat supplies the protein needs of the organism, which is about from half to one gram for each kilo body weight per diem, in the most assimilable, tonic and appetizing manner)." *Suśruta* I. 46. 53²¹³.

Domesticated Animals : "The meat of domesticated animals, relieve flatulence, is nourishing, produces 'kapha and pitta', is sweetish in taste, non acidifying in reaction, enhances metabolism and is stimulating.

212. रुद्रवज्रसुह कलायमजुह - समुद्रमङ्गल्यवपकसतीनविपुटहरिणादकोप्रभृतयो
वे दत्ताः ॥ २५

कषायमधुराः शीताः कटुपाका मरुत्कराः ।

बहुसूत्रपुटीषाय पित्तदे अहराक्षया ॥ २६

सुशुत-संहिता, सुवस्थानम्, ४६ ।

213. जलीयया आनूपा याव्याः क्रव्यभुज एकगप्ता आङ्गलाश्चेति वय्मांसवर्गाः ।

सुशुत-संहिता, सुवस्थानम्, ४६ ।

Goat : Goat-meat is oxidized without the generation of excessive heat, is heavy (if old, tough or fatty), fattening, moderates '*pitta* and *kapha*', cures constipation and catarrh (goat's meat is not liked by some for its peculiar odor due to '*hircine*', otherwise if the animal is young and the meat is not fatty, it is easily digestible).

Mutton : Mutton is nourishing, produces '*pitta* and *śleṣma*'. is hard to digest (especially if it be of tough fiber or fatty, as the mutton fat has a very high melting point).

Mutton : The mutton of the broad-tailed sheep (*medaḥ-puchchha*) is a muscle-builder, and in other characteristics, it resembles the (ordinary) mutton.

Beef : The beef cures tuberculosis, respiratory diseases, catarrh, and typhoid ; it is very beneficial to the hard-workers and for those who have good digestion ; it is purifying and relieves flatulence." *Suśruta* I. 46. 45-89 ²¹⁴.

214. 'शाम्बा वातहराः सर्व्वे हं हृषाः कफपित्ताः ।

मधुरा रसपाकाभ्यां दीपना वलवईनाः ॥ ८५

नातिशीतो गुहः क्षिण्णो मन्दपित्तकफः शृतः ।

हृगलक्ष्मणमिष्यन्दी तेषां पीनसनाशनः ॥ ८६

हं हृषं मांसमोरधं पित्तश्लेष्मावहं गुहः ॥ ८७

मेदःपुष्कोत्तव' हृष्यनीरधसहृषं गुथैः ॥ ८८

Venison : The venison is astringent-sweetish, easily digestible, relieves flatulence and biliousness, oxidizes with rapid heat production, is a cardiac stimulant, and relieves vesical troubles." *Suśruta* I. 46. 53¹⁵.

Boar's meat : "Boar's (*Sus scrofa*) meat is sudorific, nourishing, muscle-builder, refrigerant (reflex reaction of perspiration), appetizing, hard to digest (especially fatty and coarse meat) fattening, relieves fatigue, flatulence, and is strengthening." *Suśruta* I. 46. 102¹⁶.

"The meat of boar and pig is fattening, stimulating, tissue-builder, tonic (removes lassitude), carminative, strengthening, appetizing, sudorific and heavy " 2. 27. 32^{16a}.

Fowls : "Partridge (*perdix chinensis*) is

आसकासप्रतिश्याद-विषमज्वरनाशनम् ।

अनात्यग्निद्वितं गन्धं पवित्रमग्निलापहम् ॥ ८८

सुशुत-संहिता, सूत्रस्थानम्, ४६ ।

215. मृगाः कषाया मधुरा लघवो वातपित्तहरास्त्रीक्षा हृद्या वक्षि-
शोधनाश्च ॥ ४९ सुशुतसंहिता, सूत्रस्थानम्, ४६ ।

216. स्नेहनं दृक्कणं हृष्यं शीतलं तर्पणं गुह ।

स्निग्धं अमानिलहरं वाराहं बलवर्धनम् ॥ १०२

सुशुतसंहिता, सूत्रस्थानम्, ४६ ।

216.(a) स्नेहनं दृक्कणं हृष्यं अमन्नमग्निलापहम् ।

वाराहपिशितं बल्यं रोचनं स्नेहनं गुह ॥

चरक-संहिता, सूत्रस्थानम्, २७ ।

restorative, enhances metabolism, astringent-sweetish, is oxidized with pungency, and is a good diet (during convalescence) in acute complicated cases." *Suśruta* I, 46-59²¹⁷.

"Snow-partridge (*Tetraogallus himalayaensis*) is slightly heavy, is oxidized with excessive heat production, sweetish, is a muscle-builder, improves memory (by accelerated circulation) and enhances metabolism, tonicises the entire system, is laxative and improves the complexion. Particularly its white variety cures hiccup, respiratory lesion and flatulence." *Suśruta* I. 46. 60²¹⁸.

"Chicken is fattening, is oxidized with excessive production of heat, relieves flatulence, builds muscles, improves voice, is strengthening and stimulating; the domesticated chicken is heavier than its wild variety, and is beneficial in (fermentative) flatulence, consumption, (acid)

217. रुंयाहो दीपनश्चैव कषायनधुरो लघुः ।

लावः कटुविपाकश्च सन्निपाते च पूजितः ॥ ५६

सुसुतसंहिता, सूत्रस्थानम्, ४६ ।

218. ईषद्गुरुश्चनधुरो हृष्यो निधाप्रिवर्धनः ।

तित्तिरिः सर्व्वदीपन्नो याहो बन्ध प्रसादनः ॥

हिकान्वासानिलहरो विश्वैवाद्गौरतित्तिरिः ।

सुसुतसंहिता, सूत्रस्थानम्, ४६ ।

vomitings, and (chronic malarial) intermittent fever." *Suśruta* I. 46.63²¹⁹.

"Pigeons etc. are astringent-sweetish, desiccant, frugivorous, provoke flatulence, *pitta* and *śleṣma*, are oxidized without much heat, produce oliguria and leave a very scanty residue. Of them, *bhedāśi* causes all kinds of disturbances and intestinal decomposition. The wild pigeon is astringent sweetish-saline (in taste) and is heavy. The domesticated pigeon is beneficial in gastrorrhagia, is astringent, stimulating, non-acidifying in reaction, and is heavy. The wild sparrow is sweetish, fattening, increases '*kapha*' and is aphrodisiac. The garden sparrow is beneficial in gastrorrhagia, and is a strong aphrodisiac." *Suśruta* I. 46. 65-69²²⁰.

219. खिग्धोऽप्योऽनिलङ्का इत्यः स्वेदस्त्रयलावहः ।

वृङ्क्षः कुक्षुटो वन्यस्तद्व्याप्त्यो गुरुस्त सः ।

वातरोगचयवमी-विषमज्वरनाशनः ॥ ६३

सुश्रुत-संहिता, सुवस्थानम्, ४६ ।

220. कषायमधुरा रूचाः फलाहारा मरुत्काराः ।

पित्तश्लेष्महराः शीता वन्यसूत्राल्यवर्जसः ॥ ६५

सर्द्धदीपकरस्त्रेष्वां भेदाशी मलदूषकः ॥ ६६

कषायस्तादुलवण्यो गुरुः काष्णकपीतकः ॥ ६७

रक्तपित्तप्रशमनः कषायो विशदोऽपि च ।

विपाकी मधुरस्यापि गुरुः पारावतः क्षृतः ॥ ६८

"Goose, crane, heron, ruddy goose, osprey, teal, duck, pheasant, a variety of crane (*Ardea nivea*), small crane, duck (*Pelicanus fuscicallus*), heron, drake, bar-headed goose (*Anser indicus*), Chinese goose (*Cygnopsis cygnoides*), *Turdus ginginianus*, *Corvus aquaticus*, 4 members of the *Antidæ* family, water cock, *Cocculus melano-leucus* and the wild goose are called '*plava*' (aquatic floating birds) and they are gregarious. They are beneficial in gastrorrhagia, are oxidized without the production of excessive heat, fattening, muscle-builder, relieve flatulence, laxative and diuretic, sweetish, and non-acidifying in reaction. But of them the goose is hard to digest, is oxidised with the production of an excessive heat, sweetish, fattening, improves voice and complexion, strengthening, stimulating, aphrodisiac and carminative." *Suśrūta* I, 46. 105-107²²¹.

Mollusca : Conch (*Strombus gigas*), mussel,

कुलिङ्गी मधुरः क्षिप्रः कफशूलविघ्ननः ।

रक्तपित्तहरो वैश्व-कुलिङ्गस्त्वतिशुक्लः ॥ ६८

सुसुत-संहिता, स्वस्थानम्,

221. ईशसारसक्रीचकक्रवाक-कुरुर-कादम्ब-कारख्य-जीवन्नीयक-यक-बलाका-
पुष्करोकप्रवमरारोमुख-मन्दीमुख-मद्गूत्क्रोत्र-काचाच-मल्लिकाच-शुक्राच - पुष्करायिका-
कीनाचकाचकुल टिका-नीचराच-चेतचरच-प्रभृतयः प्रवाः रुचातचरिचः ॥ १०५

oyster, snail (*Helix pomatia*), and large-shelled snail or cockle are called '*kośastha*' (mollusca).

Amphibia : Turtle, crocodile, red crab (cancer pagurus), shore crab (*carcinus moenus*), and porpoise (*Delphinus gangeticum*) are called '*pādi*' (footed).

They are sweetish, non-acidifying in reaction, carminative, are oxidized without the production of much heat, fattening, sedative, laxative and increases *kapha*.' *Suśruta* I. 46.108-110²²².

Fish : "Fishes are of two kinds—fresh-water and marine. "*Suśruta* I.46.112²²³.

"Fresh-water fishes are sweetish, heavy,

रक्तपित्तहराः शीताः क्षिग्धा हृष्या मद्धञ्जितः ।

खट्वसूत्रपुरीषाश्च मधुरा रसपाकयोः ॥ १०६

गुरुश्चमधुरः क्षिग्धः स्वरवर्णबलप्रदः ।

वृंहण्यः शुक्रलक्ष्मीर्वा हंसी वातविकारनुत् ॥ १०७

सुशुत-संहिता, सूत्रस्थानम्, ४६ ।

222. शङ्खशूलनखयुक्तिशम्बूकभङ्गकामभृतयः कोशस्थाः ॥ १०८

कूर्मकुम्भीरककर्कटकलञ्चककर्कटकशिग्रुमारप्रभृतयः पादिनः ॥ १०९

शङ्खकूर्मादयः स्वादु-रसपाका-मद्धन्नुदः ।

शीताः क्षिग्धा हिताः पित्ते वर्धस्थाः श्लेष्मवर्धनाः ॥ ११०

सुशुत-संहिता, सूत्रस्थानम्, ४६ ।

223. मल्लग्रास्तु विविधा नादयाः सामुद्राश्च ।

सुशुत-संहिता, सूत्रस्थानम्, ४६ ।

carminative, hemorrhagic, are oxidized with production of excessive heat, aphrodisiac, fattening, and leave little residue. "*Suśruta* I.46. 113²²⁴.

"Sea-fishes are heavy, fattening, sweetish, do not increase '*pitta*' excessively, are oxidized with an excessive production of heat, carminative, muscle-builder, and increase '*śleṣma*.'" *Suśruta* I. 46.120²²⁵.

Milk : "There are eight kinds of milk (available for general uses, viz. : cow's milk, goat's milk, camel's milk, sheep's milk, buffalo's milk, mare's milk, woman's milk and elephant's milk. As these animals eat various kinds of food-stuffs, and their milk is the essence of the product of their metabolism (during lactation), therefore the milk is vitalizing, heavy (?), sweet, viscid, refrigerant, fattening, emollient, laxative and demulcent ; so the milk is regarded as the vital fluid (product) of the animal.

224, नादेया मधुरा मल्लया गुरवो मास्तापहाः ।

रक्तपित्तकराश्चोष्ण हव्याः क्षिप्वाल्पवर्जसः ॥ ११९

सुश्रुत-संहिता, सुवस्थानम्, ४६ ।

225. सासुद्रा गुरवः क्षिप्वा मधुरा भातिपित्तलाः ।

उष्ण वातहृदा हव्या वर्जस्याः क्षेपवर्जिनाः ॥ १२०

सुश्रुत-संहिता, सुवस्थानम्, ४६ ।

As milk is beneficial to the (young) animal (for growth and development), so all kinds of milk are good for the animal life. Only it is counter-indicated in the derangements of '*vāta, pitta, blood and mind*'. It is beneficial in chronic fever, bronchitis, dyspnea, consumption, tuberculosis, cancers, insanity, tymphanites, epilepsy, vertigo, intoxication, hyperæmia, polydipsia, cardiac troubles, vesical lesions, anemia, chronic dysentery, piles, colic, ascites, diarrhœa, leucorrhœa, diseases of the female genital apparatus (gonorrhœa), abortion, gastrorrhagia, fatigue, and pleurisy. Milk is depurant, strengthening, muscle-builder, oxidizer, fattening, restorative, analeptic, delays senility, promotes longevity, vitalizing, stimulating, emetic, laxative, and having the same quality of the bone-marrow, it increases hematogenesis. It is a good diet for the children, the aged, wounded, emaciated, starved, or those exhausted by sexual excess.

Cow's milk : Cow's milk is non-salivant, fattening, heavy (?), oxidizer, beneficial in gastrorrhagia, refrigerant, sweetish, non-acidifying in reaction (?), vitalizing and very hypotensive.

Goat's milk : Goat's milk possesses the same

properties as cow's milk ; but it is specially beneficial in tuberculosis, is light, restorative and cures dyspnea, bronchitis and gastrorrhagia ; as the goats are of small size, feed upon pungent-bitter substances, drink little water and take constant exercise, their milk is good in all diseases.

Camel's milk : Camel's milk is desiccant (?), calorific, slightly saline, of pleasant taste, light, and is beneficial in inflammation, cancers, ascites, piles, intestinal worms, skin lesions and poisonings.

Ewe's milk : Ewe's milk is sweetish, fattening, heavy (fat : 6.18), and moderates '*kapha and pitta*' ; it is a good diet in rheumatism and hebetie cough.

Buffalo's milk : Buffalo's milk is salivant, sweetish, lowers metabolism (?), somnifacient and induces chills (as the buffalo abounds in marshy places, where the malaria is rampant, the symptoms-complex, especially the chills and the metabolic derangements of malaria have been mistakenly attributed to the buffalo's milk); the buffalo's milk contains more fat than the cow's milk, and is heavier.

Mare's milk : Mare's milk is strengthening, beneficial in the rheumatism of the extremities,

of acidulated sweetish saline taste, desiccant and light.

Woman's milk : Woman's milk is sweetish, astringent, refrigerant, can be used for irrigation of the nose and the eye-lids, promotes health, is light and oxidizing.

Elephant's milk : Elephant's milk is sweetish, astringent, muscle-builder, heavy, fattening, increases vigor, is beneficial to the eyes and is strengthening.

The milk, milked in the morning, due to the cooling influence of the night, and lack of exercise of the animals, is heavy, constipative and refrigerant ; the evening milk, on the other hand, as the animals are warmed by the sun, exercise and respiration, relieves rheumatism and fatigue and is beneficial to the eyes.

Raw milk is salivant and heavy, but if it be boiled, it becomes lighter (milk if exposed, especially in a tropical country, becomes soon contaminated, and it is a good precaution to boil it before using it) ; but this does not apply to woman's milk, where it is beneficial when it is fresh. Milk becomes contaminated, if after milking, it be exposed to cool itself ; but if it be too much boiled, it becomes heavy, but retains its tissue-building property.

The milk that is foul-smelling, sourish, discolored, or of perverted taste, or if it be mixed with salt, or coagulated, should not be used. *Suśruta* I. 45. 44-57²²⁶.

226. गन्धमाजं तथा चौरमाविकं माह्विषञ्च यत् ।

अन्नायाश्चैव नार्थाश्च करेणूनाञ्च यत् पयः ॥

तत् त्वनेकौषधिरस-प्रसादं प्राणदं गुह ।

मधुरं पिच्छिलं शीतं क्षिण्वं द्रव्यं सरं मदु ॥

सर्वप्राणभृतां तच्चात् सारम्यं चौरमिहोच्यते ॥ ४४

तत्र सर्वमेव चौरं प्राणिनामप्रतिषिद्धं जातिसारम्यात् । वातपित्तश्लेष्मितामस-
विकारेष्वविरुद्धम् । औषधैर्वरकासन्नासजोषचयगुणोन्मादोदरमूत्रार्थममददाहपिपासा-
हृत्क्षिपाशुरोगवृद्धौदीवायः - शूलोदावर्त्तातिसार - प्रवाहिकावोमितोगगर्भाश्वावरक्तपित्त-
श्रमकृमिहरं पाप्मापहं बल्यं हृद्यं वाजीकरणं रसायनं मिथ्यं सन्धानमाह्लापनं
वयःश्वापनमायुष्यं जीवनं हृद्दणं वसनं विरेचनञ्च मुख्यगुणत्वाच्चौजसो वर्धनमिति
बालहृत्क्षतचोष्णानां शुद्धावायव्यायामकर्षितानाञ्च पथ्यतमम् ॥ ४५

गोचौरमनभिष्यन्दि क्षिण्वं गुह रसायनम् ।

रक्तपित्तहरं शीतं मधुरं रसपाकयोः ॥

जीवनीयं तथा वात-पित्तघ्नं परमं श्रुतम् ॥ ४६

गन्धतुल्यगुणत्वाजं विशेषाच्छौषिणे हितम् ।

दीपनं लघु संशोधि न्नासकासाक्षपित्तनुत् ॥

अजानामल्पकायत्वात् कटुतिक्तमिविवणात् ।

नाल्यन्वपानाद्यायामात् सर्वव्याधिहरं पयः ॥ ४७

रुचौषं लवणं क्षिण्वदौघं स्वादुरमं लघु ।

शोकगुब्बोदराशौर्न क्रिमिकुष्ठविषापहम् ॥ ४८

आविकं मधुरं क्षिण्वं गुह पित्तकफावहम् ।

पथ्यं केवलवातेषु कासे चानिलसम्भवे ॥ ४९

Sour-milk : "Sour milk of cow is fattening, sweet in reaction (lactic acid in reaction) oxidizer, carminative, depurant (anti-putrefactive), and appetizing," *Suśruta* I. 45. 61²³⁷.

महाभिष्यन्दि मधुरं माहिषं वज्रिनाशनम् ।

निद्राकरं श्रोतकरं गव्यात् खिग्धतरं गुरु ॥ ५०

उष्यच्चैकशफं वन्यं शाखावातहरं पयः ।

मधुराक्षरसं दध्मं लवणानुरसं लघु ॥ ५१

नार्यास्तु मधुरं सान्यं कषायानुरसं हिमम् ।

नस्याश्च्योतनयोः पय्यं जीवर्गं लघु दीपनम् ॥ ५२

हृत्किन्वा मधुरं हृद्यं कषायानुरसं गुरु ।

खिग्धं स्वेर्य्यकरं श्रोतं चक्षुष्यं बलवर्धनम् ॥ ५३

प्रायः प्राभातिकं चोरं गुरु विष्टम्नि श्रोतलम् ।

रामी. सोमगुणत्वाच्च व्यायामाभावतस्तथा ।

दिवाकराभितप्तानां व्यायामानिलसेवनात् ।

वातानुलोमि श्रान्निघ्नं चक्षुष्यश्चापराक्षिकम् ॥ ५४

पयोऽभिष्यन्दि गुर्व्वाभं प्रायशः परिकीर्तितम् ।

तदेवोक्तं लघुतरमनभिष्यन्दि वै श्रुतम् ।

वर्ष्ययित्वा स्त्रियाः सान्यमानमेव हि तद्धितम् ॥ ५५

धारोष्णं गुणवत् क्षीरं विपरीतमतोऽन्यथा ।

तदेवातिश्रुतं सर्वं गुरु हं हृद्यमुच्यते ॥ ५६

अनिष्टगन्धमक्लृप्तं विवर्णं विरसञ्च यत् ।

वर्ण्यं सलवणं क्षीरं यच्च विययितं भवेत् ॥ ५७

सुश्रुत-संहिता, सूक्ष्मानु, ४५ ३

227.

खिग्धं विपाके मधुरं दीपनं बलवर्धनम् ।

वातापहं पवित्रञ्च दधि गव्यं दधिप्रदम् ॥ ६१

सुश्रुत-संहिता, सूक्ष्मानु, ४५

Whey : "Whey is acidulated sweetish astringent, is oxidized rapidly, light, pungent, oxidizer, antitoxic, is beneficial in (intestinal) inflammation, diarrhoea, chronic dysentery, piles, splenitis, tumors, intermittent fever, polydipsia, vomiting, stomatitis, colic, adiposis, catarrh and flatulence ; it is non-acidifying in reaction (?), cardiac stimulant, beneficial in strangury, adipositis, and is not a tissue builder. *Suśruta* I. 45. 77²²⁸.

III.—Fats.

Butter : "Fresh-churned butter is energizing, calorific (*dīpana*) and cardiac stimulant, and is beneficial in chronic dysentery, piles, trismus and anorexia." *Charaka* I. 27. 100²²⁹.

Oil ; Sesame oil is slightly astringent, of pleasant taste, minute (of minute fat globules), calorific, diffusive, increases '*pitta*' (*pitta* is regarded as the humor and the seat of com-

228. तक्रं मधुरमन्नं कषायानुरसमुच्चवीर्यं लघु रुचनसिदीपनं गरभोक्ताती-
सार-यक्ष्मी-पाण्डुरोगार्थः-ऋह-गुल्माशोक-विषमज्वर-लघ्नाच्छद्भि प्रसेकयुलनिदःक्षेपानि-
सङ्गं मधुरविपाकं हृद्यं मृत्तुल्लक्ष्णे हृद्यापत्रप्रयमनमहद्विषम् ॥ ७७

सुसुप्त-संहिता, सुखस्नानम्, ४५ ।

229. संयाद्वि दीपनं हृद्यं श्वनीतं नवीकृतम् ।

यक्ष्मार्थोविकारजनहर्हि तादृचिनायनम् ॥

चरक-संहिता, सुखस्नानम्, २७ ।

bustion energy and heat-metabolism), is laxative and diuretic. It does not increase phlegma, but is the best carminative ; it is energizing, beneficial to the skin, increases fat (*medas*) and heat (*agnivarddhna*)." *Charaka* I. 27. 137²³⁰

IV.—*Vegetables.*

Vegetables : "The cucumber, (*Cucumis sativus*), field-cucumber (*Cucumis utilissimus*), gourd (*Benincasa cerifera*), water-melon etc. are indigestible, retards digestion (of other foods), refrigerant, savorous, phlegmatic, laxative, diuretic, contain potash and are sweetish.." *Suśruta* I. 46. 227²³¹.

"The lotus root, the lotus, esculent root of the lotus, fibers of the stalk of the lotus, root of *Scripus kysoor*, *Trapa bisponosa* and water weeds are indigestible, arrest digestion and are

230. कषायानुरसं स्वादु सूक्ष्मं व्यवायि च ।

पित्तं वद्विन्मूत्रं न च श्लेष्माभिवर्धनम् ॥

वातघ्ने बूत्तमं वक्ष्यं त्वय्यं मेधाप्रिवर्धनम् ।

चरक-संहिता, सूत्रस्थानम्, २७

231. तपुसैर्वातकर्कराशौर्ध्वान्तप्रभतीनि ॥ २२६

गुरुविष्टम्भिशीतानि स्वादूनि कफजनानि च ।

सृष्टसूत्रपूरीषाणि सञ्चारमधुराणि च ॥ २२७

सुश्रुत-संहिता, सूत्रस्थानम्, ४६ १

refrigerant ; the stalk, flower and fruit of white and blue water-lilies (*Nymphaea esculenta* and *Nymphaea stellata*) are savorous, astringent, refrigerant, and provoke '*phlegma*' and flatulence. *Charaka* I. 27. 54²³².

Fruits : "*Pomegranate* is astringent, non-calorific, oxidizer, appetizing, refreshing and constipative. *Suśruta* I. 46. 144²³³.

"*Prune* provokes excessive flatulence, is laxative and reduces '*kapha and pitta*'." *Suśruta* I. 46. 169²³⁴.

"*Fig* retards digestion, is sweet, fattening, refreshing and indigestible." *Suśruta* I. 46. 134²³⁵.

"*Cocoa-nut* is indigestible, fattening, moderates '*pitta*', sweetish, refrigerant, energizing, refresh-

232. तद्विषयशालूकक्रीचादनकशेखरम् ॥
 मृन्नाटकमङ्गलीयस्य गुहविष्टभिशीतलम् ।
 कुमुदीप्यलनालासु सपुष्पाः सफलाः स्रुताः ।
 शीताः स्वादुकावायासु कफमारुतकोपनाः ॥
 चरक-संहिता, सुवस्थानम्, १७ ।
233. कषायागुरसं तेषां दाहिमं नातिपित्तलम् ।
 दीपनीयं हृषिकरं द्रव्यं वर्ज्यं विवर्ज्यम् ॥
 सुसुत-संहिता, सुवस्थानम्, ४६ ।
234. अत्यर्थं वातलं याहि जाल्वं कफपित्तजित् ॥ १६८
 सुसुतसंहिता, सुवस्थानम्, ४६ ।
235. विष्टभि मधुरं श्लिग्धं क्लृप्तं तर्पयं गुह ॥ १७६
 सुसुत-संहिता, सुवस्थानम्, ४६ ।

ing, stimulating and diuretic." *Susruta* I. 46. 184²³⁶.

Grape is laxative, improves voice, sweet, fattening, refrigerant, and relieves gastrorrhagia, febricula, dyspnea, polydipsia, hyperemia and emaciation." *Susruta* I. 27. 146²³⁷.

V.—*Stimulants.*

"*Salt* is appetizing, digestive, laxative and carminative." *Charaka* I. 27. 146²³⁸.

Spices : "Foeniculum Nigella indica, Ptychotis ajowan, Cumminum cuminum, Coriandrum sativum and the leaf of Piper longum are digestive, oxidizing, carminative, antitoxic (relieves 'kapha') and is deodorant." *Charaka* I. 27. 148²³⁹.

236. गारिकेशं गुहं क्षिण्धं पित्तघ्नं स्वादु शीतलम् ।
बलमांसप्रदं हृद्यं हृदयं वक्षिषोधनम् ॥ १८४
सुश्रुत-संहिता, सूत्रस्थानम्, ४६ ।
237. तेषां द्राक्षा सुरा स्त्रियां मधुरा क्षिण्धशीतला ।
रक्तपित्तश्वरवास-दृक्षादाहृद्ययापहा ॥ १८८
सुश्रुत-संहिता, सूत्रस्थानम्, ४६ ।
238. रोचनं लवणं सर्व्वं पाकि कंक्षुनिषापहम् ॥
चरक-संहिता, सूत्रस्थानम्, २७ ।
239. कारव्यः कुक्षिकाशनी कबरी धान्यतुण्ड ।
रोचनं दीपनं वातकफदीर्गव्याघ्रनाशनम् ॥
चरक-संहिता, सूत्रस्थानम्, २७ ।

Liquors : "All acidulated wines cause biliousness, increase digestive power, are appetizing, emetic, desiccant, carminative, cardiac stimulant, vesical disinfectant (?), easily oxidized, irritant, are oxidized with liberation of excessive heat, pungent, excitant of the senses, exhilarant, laxative and diuretic." *Suśruta* I. 45. 155²⁴⁰.

"*New Wine* is salivant, heavy, provokes flatulence, has disagreeable flavor, non-savourous, non-refreshing and irritant.

Old Wine has fine aroma, stimulates digestion, is refreshing, appetizing, anthelmintic (or bactericidal), depurant (?), quickly oxidized, desiccant and carminative." *Suśruta* I. 45. 179-180²⁴¹.

240. सर्वं पित्तकरं मद्यमन्नं दीपनरोचनम् ।

भेदनं कफवातघ्नं हृद्यं बलविशोधनम् ॥

पाके लघु विदाद्युष्णं तीक्ष्णमिन्द्रियबोधनम् ।

विकासि स्रष्टविस्मृतं श्रेण तस्य विश्लेषणम् ॥ १५५

सुश्रुत-संहिता, स तृस्थानम्, ४५

241. नवं मद्यमभिष्यन्दि गुरु वातादिकोपनम् ।

अनिष्टगन्धि विरसमहृद्यञ्च विदाहि च ॥ १७६

सुगन्धि दीपनं हृद्यं रोचिष्णु क्षिप्रिनाशनम् ।

कृष्टस्रोतस्करं जीर्णं लघु वातकफापहम् ॥ १८०

सुश्रुत-संहिता, सूत्रस्थानम्, ४५ :

“The wine that is opaque, irritant, malodorous, insipid, with yeast fermentation, heavy, non-enlivening, new, sharp (with a high percentage of alcohol), oxidized with a great amount of heat, which has been kept in a foul vessel, which has been made with insufficient materials, which has been kept exposed in an open bowl over night, colorless, should not be taken, as well as the wine left over from another person.” *Suśruta* I. 45. 185²⁴³.

“Wine is prescribed in emaciation, strangury, chronic dysentery, or for the person who has lost blood; it is a carminative and a galactagogue. It is beneficial in hiccup, dyspnea, catarrh, bronchitis, constipation, anorexia, vomiting, tympanites, fecal impaction, and flatulence. “*Suśruta* I. 27. 93²⁴³.

242. सान्द्रं विदाहि दुर्गन्धं विरसं क्लिप्तं गुरु ।
 अदृश्यं तरुणं तीक्ष्णमुष्णं दुर्भाजनस्थितम् ॥
 अस्वीयधं पर्युषितमत्यच्छं पिच्छिलञ्च यत् ।
 तद्वज्यं सर्वदा मद्यं किञ्चिच्छेषन्तु यन्नवेत् ॥ १८५
 सुशुत-संहिता, सूत्रस्थानम्, ४५ ।
243. कृशानां सक्तमूत्राणां यद्वृक्षशोषिकादिस्थानम् ।
 सुरा प्रशस्ता वातघ्नी क्षन्त्यरक्तचयेषु च ॥
 द्विकान्वासप्रतिश्लायकासवर्धोयहावची ।
 बध्नानाङ्गविबन्धेषु वातघ्नी मदिरा हिता ॥
 चरक-संहिता, सूत्रस्थानम्, १० ।

VI.-Water.

"The water falling from the clouds is tasteless (without any distinct taste), vitalizing (acts as an ambrosia), beneficial to life, refreshing, sustaining, circulatory (entering into every tissue metabolism), and removes lassitude, fatigue, thirst, intoxication, vertigo, somnolence, sleep and hyperemia.

The water-vapor of the sky falling upon the earth takes the taste of the place where it falls, and the water of the river, rivulet, lake, pond, dam, well, pool, fountain, vegetable sap, subterranean stream, field inundation, and pond in a swampy region covered with algae and filled with water-weeds, is sweetish." *Suśruta* I. 45. 2.3²⁴⁴.

"The water vapor of the sky falls upon the earth in different ways, viz. : as (1) rain ; (2) hail ; (3) dew ; and (4) snow. Of them, the rain-water is the best for its lightness. The rain

244. पानीयमानरीक्षमनिह्यरसमस्यतं जीवणं तपश्च धारयन्नावासजननं
अमलं क्लमपिपासानदमूर्च्छातन्द्रानिद्रादाहप्रशमनमेकान्ततः पथ्यतमञ्च ॥ २

तदेवावनीपतितमम्यतमं रसमुपलभते स्थानविशेषाद्गदी-नद-सरसङ्गानवापी-भूप-
चुम्बी-प्रस्रवणीद्विहिकिरकेदार-पल्लादिषु स्थानेष्ववस्थितमिति ॥

सुश्रुत-संहिता, सूत्रस्थानम्, ४५ ।

also comes from (the vapor of) two sources—Gangetic (sweet) and oceanic (saline).” *Suśruta* I. 45. 5²¹⁵.

“Of them, rain from the Gangetic (vapor) is the best.” *Suśruta* I. 45. 5²⁴⁴.

Polluted Water : “The water swarming with bacteria, polluted by their toxins, or by (human) excreta, decomposed egg or dead body, covered with grasses and (fallen) leaves, contaminated or poisoned, or the inundation water of the first rainy season, if bathed in, or drunk by a person, makes him suffer soon from external lesion, (skin-diseases for bathing) and internal troubles (intestinal disorders for drinking).

The water that contains slime, mud, or is covered with algae, water-weeds and lotus-leaves etc. and in which (the rays of) the sun, (the beams of) the moon, and air (aeration can not take place) can not penetrate, and which is distinguished by any smell, color or taste, that water is to be regarded as contaminated.

The contaminated water is marked by six

245. तत्प्रान्तराच्च चतुर्विधम् । तद्वयथा—धारं कारं तीक्ष्णं क्षेममिति ।
तेषां धारं प्रधानं लघुत्वात् । तत् पुनर्विचित्रं गाङ्गं समुद्रश्चेति ।

सुश्रुत-संहिता, सूत्रस्थानम्, ४५ :

246.

गाङ्गं पुनः प्रधानम् ।

सुश्रुत-संहिता, सूत्रस्थानम्, ४५ ।

faults—in touch, appearance, taste, smell, action and reaction. Roughness (due to the presence of sand or grit) viscosity (bacterial decomposition especially of the vegetable matter), warmth (due to carbonic acid gas), tooth-sensibility (due to astringency or any other chemical agent or bacterial product) are the touch-faults of contaminated water. Mud, sand, slime and colorings (chlorophyl) are the appearance faults. Any pronounced taste is the taste-fault.. Foul-smelling is the smell-fault. If, when drunk, the water causes thirst, heaviness (in the stomach), colic, and expectoration, it is due to its action-fault. If when drunk, the water takes a long time for its digestion (passage, absorption and excretion) and is retained in the alimentary canal, it is the reaction fault. These faults are not found in the water (that falls upon the earth from condensation of the water- vapors) of the sky.

Sterilization of Water : Water should be sterilized, if of contaminated source, by boiling, warming in the sun, or by throwing into it, red-hot iron-balls, sand and stones. For its deodorization, flowers of *Rotleria tinctoria*, *Michelia champaca*, *Nymphaea cerula*, and *Bignonia suaveolens* should be kept in water over-night.

The water saturated with the fragrance of the flower, should be drunk in a gold, silver, copper, bronze, crystal or earthen bowl. Polluted water, or untimely rain water should be always avoided. He who drinks water not sterilized by boiling etc., is apt to suffer from inflammation, anemia, diseases, indigestion, bronchitis, dyspnea, catarrh, colic, tumor, ascites and other malignant diseases." *Suśruta* I. 45, 6-11²⁴⁷.

247. कोटमूतपुरीषाण्य-श्वकीयप्रदूषितम् ।
 दृणपर्णोत्करयुतं कलुषं विषसंयुतम् ॥
 योऽवगाह्य वर्षासु पिबेद्वापि नवं जलम् ।
 स वास्याभ्यन्तरान् रोगान् प्राप्नुयात् क्षिप्रमेव तु ॥ ६ *

तत्र यत् शैवालपङ्कटदृणपर्णपत्रप्रभृतिभिरवच्छन्नं शशिसूर्यकिरणानिलैर्नामिलुष्टं
 गन्धवर्णरसोपसृष्टञ्च तद्व्यापन्नमिति विद्यात् ॥ ७

तस्य स्पर्शरूपरसगन्धवीर्यविपाकदोषाः षट् सम्भवन्ति ॥ ८

तत् खरता पेच्छित्यमीणां दन्तयाहिता च स्पर्शदोषः । पङ्कसिकताशैवालवङ्ग-
 वर्णता रूपदोषः । व्यक्तरसता रसदोषः । अनिष्टगन्धता गन्धदोषः यदुपयुक्तं दृण्या-
 गौरवशूलकप्रसेकानापादयति स वीर्यदोषः । यदुपयुक्तं चिराद्विपच्यते विष्टभृति
 वा स विपाकदोष इति । त एते आन्तरिचे न सन्ति ॥ ९

व्यापन्नानामग्निकथनं सूयार्थात्प्रप्रतापनं तन्नायःपिण्डसिकतालीङ्गाणां वा निर्व्यापणं
 प्रसादनञ्च कर्त्तव्यं, नागचम्पकोत्पलपाटलापुष्पप्रभृतिभिश्चाधिवासनमिति ॥ १०

सीवण्ये राजते तावन् कांक्ष्ये मणिसयेऽपि वा ।

पुण्यावतंसं भीमे वा सुगन्धि सखिलं पिबेत् ॥

Pure water : "The water that is without smell, distinct taste, that quenches thirst, that is pure, cool, transparent, light and refreshing, is to be regarded as 'pure water'." *Susruta* I. 45. 13^{***}.

व्यापन्नं वर्ज्येन्नित्यं तोयं यथाप्यनार्त्तवम् ।

दोषसञ्जनं स्त्रीतन्नाददीताहितम् तत् ॥

व्यापन्नं सलिलं यस्तु पिवतोद्वाप्रसाधितम् ।

त्रययुं पाण्डुरोगञ्च त्वग्दोषमविपाकताम् ॥

वासकासप्रतिश्याय-शूलगुणोदराणि च ।

अन्धान् वा विषमान् रोगान् प्राप्नुयात् क्षिप्रमेव च ॥ ११

सुश्रुत-संहिता, सूत्र-स्थानम्, ४५ ।

248.] निर्गन्धमव्यक्तरसं दृष्ट्वान्नं शुचि शीतलम् ।

अच्छं लघु च हृद्यञ्च तोयं गुणवदुच्यते ॥ १२

सुश्रुत-संहिता, सूत्र-स्थानम्, ४५ ।

IX. HYGIENE.

Hospital : “By an expert architect, a large house should be built ; it should be strong, but not drafty, except the current of air shall pass in one direction ; it should be so built that one can easily move about within it ; it should be built on an elevated place (having nothing higher than it in the locality), and within, it should be free from smoke, sun (exposure to the sun was regarded injurious ; its disinfectant and sterilizing property was not understood), dust, noise, (sensual) touch, (exciting) ocular impressions, (spicy) taste, and (penetrating) smell (that is, whatever excites the nerves and disturbs the nervous quietude) ; and it should be provided with staircase, mortar, pestle, toilet, bath-room and kitchen.

There attendants (interns) for nursing the sick, should be appointed, who are of good character, are pure (free from any disease), obedient, clever, kind-hearted, fit for any kind of work (associated with nursing hospital

duties), expert in cooking, in bath-attendance, massage, capable of lifting and putting the sick into bed, and who do not show unwillingness for any kind of work. There experts should be engaged who are well-versed in singing, music, (in recitation of) prayers, poems, hymns, stories, history and contemporary events (for the distraction of the mind and entertainment of the sick).

There should be also kept (in the enclosure) *Tetraoperdix himalayensis*, *Galloperdix spadiceus*, hare, stag (*Cervus elaphus*), black deer, black-tailed deer (*Cervus cashmirianus*), *Dama platyceros*, and sheep. As well as gentle, milking cows with calves, free from diseases should be kept, and for them feed, sleeping places (stable) and drinking water should be provided.

There should be also cistern, pail, tub, cask, keg, pitcher, jar, ewer, platter, dipper, cooking-pot, double-boiler, bandage, thread, cotton, animal thread (horse-hair for suturation), a comfortable bed with all accessories, jug, spittoon, and all that are necessary for leaning (easy chair), sitting, (for the application of) ointment, sweating, massage, emplastrum, fomentation, embrocation, emetics, sedatives,

vulnerary .. enemata, oily enemata, errhines, urination and purgation." *Charaka* I. 15, 5-9¹⁴⁹.

Qualifications of a Surgeon : "For the practice of operative surgery, a physician has to get the *license* from the king, and for this he has to acquire a thorough knowledge of the medical science and surgery, must have keen observation and experience of operations (under a licensed preceptor or in a hospital); and before an operation, he has to pair his nails (to prevent sepsis, and to carry pathogenic

249. दृढं निवातं प्रवातैकदेशं सुखप्रविचारमनुपपत्त्यं धूमातपरजसामनभि-
गमनीयमनिष्टानाञ्च शब्दस्पर्शरसरूपगन्धानां सोपानोद्मुखल मूषलवश्चः स्थानबानभूमि-
महानसोपेतं वास्तुविद्याकुशलः प्रशस्तं गृहमेव तावत् पूर्व्यमुपकल्पयेत् ॥

ततः शीलशौचानुरागदाच्यप्रादक्षिण्योपपन्नानुपचारकुशलान् सर्व्वकर्म्मसु . पथ्यव-
दातान् सूपोदनपाचक-खापक-संवाहकोत्थापक-सन्वेशकौषधपेषकाञ्च परिचारकान्
सर्व्वकर्म्मस्वप्रतिकूलान् । तथा गीतवादितीक्ष्णापक - श्लोकगाथाख्यायिकेतिहासपुराण-
कुशलानभिप्रायज्ञाननुमताञ्च देशकालविदः परिषदाञ्च ।

तथा लावकपिञ्जलशशहरिणैर्नकालपुष्ककमृगमादकोरभान् । गाञ्च दीग्म्रीं
शैलवृत्तीमनातुरां जीवहस्तां स प्रतिविहितदण्डशरणपानीयान् ॥

जलपावाचमनोदकोष्ठमणिकपिठरघटकुम्भी कुम्भ कुण्डशरावदध्वौक परिपचन
मन्थान चेलस तूकार्पासोर्षादीनिच शयनासनादीनि चोपन्यस - भृङ्गारप्रतियह्वाणि
सुप्रयुक्तास्तरणोत्तरप्रच्छदोपधानानि स्वापाश्रयाणि सन्वेशनोपवेशनकोहस्तेदाभ्यङ्ग प्रदेह-
परिषेकानुलेपनवमनविरेचनास्थापनानुवासनशिरोविरेचनमूत्रीचारसुखानि ॥

चरक-संहिता, सूतस्थानम्, १५ ।

germs and spread infection from patient to patient), to cut short his hair (shaving for the same purpose), become purified (free from any disease, and disinfected) and shall put on (washed, disinfected) white robes, (and shall go to the operation) with umbrella (on his head), stick in his hand, sandals (in his feet), robes not highly raised (gracefully attired), having pleasant speech, uprighteous conduct, friendly to all living beings, and succor of the good." *Suśruta* I. 10. 2²⁵ .

I.—*Dietetic Hygiene.*

"Desiccated (for losing flavor and savor), or decomposed meat (to prevent ptomaine poisoning), or meat from a deceased animal (to prevent the infection of the pathogenic germs of the disease from which the animal has died), or killed by poisoning, or by a venomous snake, or by an instrument which has been covered

250. अधिगततन्त्रेणोपासिततन्त्रार्थेन दृष्टकर्मणा कृतयोग्येन शास्त्रे निगदता राजानुज्ञातेन नीचनखरोक्षा युचिना युक्तवस्त्रपरिहितेन क्लृप्तवता दण्डहस्तेन सीपानत्केनानुद्धतवेशेन समनसा कल्याणाभिव्याहारेणाकुड्डीकेन वन्धुभूतेन भूतानां सुसहायवता वैद्येन विशिखानुपवेष्टव्या ॥ २

with poisons, too old (the meat of an old animal is not only tough and unsavoury, but it also contains an excessive amount of metabolic wastes, due to the deficiency of glandular secretions and incomplete oxidation), or too young (the meat of a young animal contains an excessive amount of purine bodies, and extractives are not yet formed, which exert a tonic effect on the organism)." *Suśruta* I. 46. 129 ²⁵¹.

Evil Effects of Over-Nutrition : Any one who with sedentary habits, indulges in fatty, sweet, heavy, viscid foods, new rice, new wine, meat of animals of marshy region, or aquatic creatures, milk, and milk-products, sugar-preparations, and cakes excessively, is subject to diathesis of various lesions, and if he does not take precautionary measures against them, he suffers from diabetes, pruritus, eczema, impetigo, jaundice, fever; skin diseases, hyperacidity, strangury, anorexia, somnolence, impotence, adiposis, lassitude, foul-emanation from the body, encrusting (calcification) of the vascular system,

251. शुक्लव्याधिविषसर्प इतदिग्धविह्वलीषं कृशबालानामसात्माचारिणां मांसान्न-
भक्षयाणि ।

intellectual fatigue, enervation, ascites and other diseases." *Charaka* I. 23. 2²⁵².

"A stimulant taken in proper dose increases the strength and weight of the body, but taken excessively, it reduces the body-weight (by inducing hyper-metabolism)." *Charaka* I. 22. 25²⁵³.

Seasonal dietetic variations : "He who understands and follows the hygienic and dietetic regulations for each season, by his seasonal vari-

252. सन्तपयति यः सिग्धं मधुरैर्गुरुपिच्छिलैः ।
 नवान्नं नवमद्यं च मांसैरानूपवारिजैः ॥
 गोरसैर्गोष्ठिकैश्चान्यैः पिष्टकैश्चातिमावशः ।
 चेटाहृषी दिवास्त्रप्रशय्यासनसुखे रतः ॥
 रोगास्तस्योपजायन्ते सन्तपणमिदं विदुः ।
 प्रमेहपिडकाकोठकण्डूपाण्डूभयज्वराः ॥
 कुष्ठान्यामप्रदोषाश्च सूतकृच्छ्रमरोचकः ।
 तन्द्रा क्लेब्यमतिस्थूलमालस्यं गुरुगात्रता ॥
 रुन्ध्रियस्त्रोतसां लेपो बुद्धेर्मोहः प्रमालकः ।
 शोथश्चैवं विधाशान्ये शीघ्रमप्रतिकुर्वतः ॥

चरक-संहिता, सूत्रस्थानम्, २१ ।

253. बलं पुष्ट्युपलभ्यश्च काश्यं दोषविवर्जनम् ।
 लक्ष्यं हंहिते स्थूल्यमति चात्यर्थं हंहिते ॥

चरक-संहिता, सूत्रस्थानम्, २२ ।

ation of diet improves his complexion and increases his vigor." *Charaku* I 6. 2 ^{253a}.

Seasonal variation of food is conducive to health and vitality. In the summer one does not need so much fat as in the winter, as the caloric needs of the organism is much less, owing to the less radiation of heat from the body surface to the surrounding atmosphere. And as the cold air contains more oxygen, the increased oxygen-intake naturally enhances metabolism, and therefore one has in the winter better appetite, and can digest a large quantity of meat and other nitrogenous food, which in the summer may easily cause gastro-intestinal troubles. Carbohydrate needs of the body are also increased, as to keep the body warm, one is apt to move and to take exercise, which naturally consumes more glycogen than in the summer, and therefore an increased intake of carbohydrates becomes necessary. "Due to the contact of the cold air, digestive fire is confined, and consequently its vitality (metabolism) is increased; for this reason in

253.(a) तस्याशिताद्यादाहाराद्वलं वर्णश्च वर्धते ।

तस्यतुंसान्म्रं विदितं चेष्टाहारव्यपाययम् ॥

चरक-संहिता, सूत्रस्थानम्, ६ ।

winter, one can digest much more heavy stuffs (than in the summer)." *Charaka* I. 6. 9 ²⁵⁴.

Not to eat rapidly : Do not eat too rapidly. For if eaten too rapidly, the ingesta does not give adequate savor, nor is it properly fixed (masticated and saturated with salivary ferments), and is abnormal in its course in the alimentary canal, and its normal reactions are not perceived ; therefore one should not eat too rapidly." *Charaka* III. 1. 19 ²⁵⁵.

A lean person has more vitality than a fat person : "To make a fat person lean, indigestible food (which is insufficiently assimilated, but only given to satiate hunger) and fasting should be prescribed. And to make a lean man fat, easily digestible food to satiation should be given." *Charaka* I. 21. 16 ²⁵⁶. "But though both leanness and fatness have their inconvenience, between them, leanness is preferable, for in a

254. अंते शीतानिलस्य संसं रक्षो बलिनां बली ।

पक्ता भवति हेमन्ते माताद्रव्यगुरुणमः ॥ चरक-संहिता, सुवस्थानम्, ६ ।

255. नातिद्रुतमन्नीयात् । अतिद्रुतं हि भुञ्जानस्य तत्क्षेपणस्त्रादनभोजनस्याप्रतिष्ठानं भोज्यदोषसाङ्गं योपलब्धिसं न नियता, तस्मान्नातिद्रुतमन्नीयात् ।

चरक-संहिता, विमानस्थानम्, १ ।

256. गुरु चातपयश्चेष्टं स्थूलानां कर्षणं प्रति ।

कृशानां बृंह्यार्थं लघु सन्तपयश्चेष्टं ॥ चरक-संहिता, सुवस्थानम्, ११ ।

disease, a fat individual suffers more (accumulation of fat in the body is due to fundamentals : (1) Either excess of food is taken, especially carbohydrates, beyond the bodily needs, and with good digestion, the surplus of converted glycogen above the current expenditure is stored in the body as fat ; to a moderate extent, this is very becoming, as it beautifies the form of the body ; but in excess it is apt to interfere with the action of the heart and other vital organs by pressure as well as fatty infiltration. However, the dyspeptics do not get fat and remain lean with excessive amount of food, for the ingesta can be only partly absorbed, due to deficiency, quantitatively and qualitatively, of digestive enzymes. (2) Fatty accumulation and degeneration takes place in hypo-metabolism, due to glandular deficiency as in myxedema. On the other hand, hyper-metabolism causes gradual emaciation. As vitality is related with metabolism, so leanness not associated with nutritional insufficiency or wasting diseases, has more resisting power against pathogenic micro-organisms).” *Charaka* I. 21. 13^{256a}.

256. (a) स्थूलकाश्चैवं वरं काश्चैवं समोपकारणी हि तौ ।

यद्युभौ व्याधिरागच्छेत् स्थूलनीवातिपीडयेत् ॥

चरक-संहिता, सुवस्थानम्, २१ ।

Mental excitement interferes with Digestion :

“Worry, sorrow, fear, anger, sadness, perplexity and vigilance (sleeplessness) interfere with digestion, even if the food be good and taken in right quantity (mental excitement arrests the digestive secretions, and by raising the blood pressure by excessive secretion of adrenalin, the sympathetic nervous system becomes irritated)”
Charaka III. 2. 6²⁵⁷

Mouth Hygiene : “After eating, one should repeatedly gargle and wash out the mouth (to wash out the food particles that may be in the buccal cavity, to prevent their harboring of micro-organisms which cause decomposition and foul odor of the mouth).” *Suśruta* I. 46. 520²⁵⁸.
 “Food particles sticking in or within the (crevices of) teeth, should be taken out slowly with tooth-picks ; for otherwise they cause foulness of the mouth (The negligence of these two simple oral hygienic rules, is spreading fast in India, as in

257. मावयाप्यभ्यवहृतं पथ्यं चान्नं न ज्ञेयंति ।

चिन्ताशोकभयक्रोधदुःखमोहप्रजागरेः ॥

चरक-संहिता, विमानस्थानम्, २ ।

258. प्रचालयेदन्निरास्यं भुञ्जानस्य मुहुर्मुहुः ।

समस्त-संहिता, सुवस्थानम्, ४६ ।

Europe, the *Dental Caries*).” *Suśruta* I. 46. 525¹⁶⁹.

Foods to be avoided : “The food that is discolored, contaminated, left over (from the plate of some one else), mixed with pebbles, grass or similar substances, repulsive in appearance, kept over night, insipid, or decomposed, should not be taken ; nor the food that is cooked for a long time (vitamines is destroyed by over-cooking or cooking at a high temperature), is hardened (digestive ferments can not penetrate through hardened masses), cold (the ingesta has to be heated to the body temperature before the digestive ferments can act energetically upon them and they can be absorbed), cooked again, porridge having uneven cooked grains, and what is cooked at a high temperature.” *Suśruta* I. 46. 518¹⁷⁰.

II.—General Hygiene

Not to interfere with the natural call of Nature : “An intelligent person should not

259. दन्तान्तरगतञ्चान्नं शोधनेनाहरेच्छनेः ।
 कुर्यादनाहतं तद्धि सुखस्यानिष्टगन्धताम् ॥ ५१५
 सुशुतसंज्ञिता, सुस्थानम्, ५६ ।
260. अचोषं दुष्टमुच्छिष्टं पाषाणदण्डलोद्भवत् ।
 शिष्टं व्युषितमस्त्रादु पूति चाम्नं विवर्जयेत् ॥
 सुशुत-संज्ञिता, सुस्थानम्, ५६ ।

retain (interfere with the passage by the voluntary contraction of the muscles) feces, urine, intestinal gas, vomiting, sneezing, yawning, hunger, thirst, tears, sleep or the fatigued breath (carbon dioxide).” *Charaka* I. 7. 2⁵⁰¹.

Periodic Cleaning of the System : “In the spring, in the rainy season, and the autumn, one should cleanse his system. First he should use ointment, then sweating, and after that emetics and purgatives. Later enemata and errhines should be given (The periodic flushing of the intestines by enemata or purgatives, is now recognized by all as a good hygienic prophylaxis. In weakness of the kidney, Turkish bath twice or thrice a year is also very desirable, to throw out of the system the accumulated toxins through the skin, which the kidney has failed to eliminate or as a relief to the over-worked kidneys).” *Charaka* I. 7. 35²⁶².

261. न वेगान् धारयेद्दोषान् जातान् सूत्रपुरीषयोः ।

न रेतसो न वातस्य न वम्याः क्षवथो न च ।

नोद्गारस्य न जम्भाया न वेगान् क्षुत्पिपासयोः ।

न वायस्य न निद्राया निःश्वसस्य श्मिथ च ॥

सुसुप्तसंहिता, सूत्रस्थानम्, ७ ।

262. माधवप्रथमे मासि नभस्य प्रथमे पुनः ।

सहस्य प्रथमे चैव हारयेद्दोषसंशयम् ॥

चरक-संहिता, सूत्रस्थानम्, ७ ।

Physical Exercise : Exercise is the exertion to invigorate and to increase the strength of the body ; one should take physical exercise measuredly. For it induces lightness, agility, vigor, endurance, removes flatulence, and increases metabolism. But if it be done in excess, it brings about lassitude, fatigue, spermatorrhea, gastrorrhagia, dyspnea, bronchitis, fever and vomiting". *Charaka* I. 7. 24-26²⁶³.

Excess to be avoided : "An intelligent person, even if necessary, should not indulge in excess of exercise, laughing, speaking, travelling, sexual intercourse and vigilance." *Charaka* I. 7. 27²⁶⁴.

"A person who takes regular exercise, and eats after his previous meal has been digested, and takes barley and wheat, does not suffer from

263. शरीरचे दृष्टा या चे दृष्टा स्थैर्यार्था वलवर्द्धिनी ।

देहव्यायामसंख्याता मात्रया तां समाचरेत् ॥

लाघवं कर्त्तव्यं सामर्थ्यं स्थैर्यं क्षिप्रसङ्घिषता ।

दोषत्रयोऽग्निवृद्धिश्च व्यायामादुपजायते ॥

शूलः कृमिः शयच्छब्दा रक्तपित्तं प्रतामकः ।

अतिव्यायामतः कासो ज्वरश्चर्द्द्विष जायते ॥

चरक-संहिता, सूत्रस्थानम्, ७ ।

264. व्यायामह्रास्यभाष्याध्वयाम्यधर्मप्रजागरान् ।

नोचितानपि सेवेत बुद्धिमानतिमात्रया ॥

चरक-संहिता, सूत्रस्थानम्, ७ ।

over-eating, and he loses his adiposis. "*Charaka* I. 23. 10²⁶⁵.

Purgatives and Purgation : "The best of root purgatives is *Ipomœa turpethum*, of the barks—*Symplocos racemosa*, of the fruits—*Terminalia chebula*, of the oils—*Ricinus communis* (castor oil), of the juice—*Cleome pentaphylla*, and of the milky exudations—that of *Euphorbiæ antiquorum*." *Suśruta* I. 44. 2²⁶⁶.

"The effectiveness of purgation is marked by subsidence of weakness, emaciation (loss of body weight), fatigue and the course of the disease, the improvement of the heart's action, clearness of complexion, normal appetite and thirst, normal inclination for evacuation of feces and urine, improvement in the sense perceptions and

265. व्यायामनिवृत्त्यो जीर्णांशो यवगोधमभोजनः ।

सन्तप्य षष्ठतैर्दोषैः स्थूलं सुक्ता विमुच्यते ॥

चरक-संहिता, सूक्ष्मस्थानम्, २३ ।

266. अरुणामं तिष्ठन्मलं श्रेष्ठं मूलविरेचने ।

प्रधानं तिलकस्वच्छं फलेष्वपि हरीतकी ॥

तैलेष्वे रण्डजं तैलं खरसे कारवेल्लिका ।

सुधापयः पयःसूक्तमिति प्राधान्यसंयुक्तः ॥

सुश्रुत-संहिता, सूक्ष्मस्थानम्, ४४ ।

the mind, passage of the intestinal gas, and the increased metabolism." *Charaka* I. 16. 3²⁶⁷.

Do not sneeze before covering your mouth : "Without covering your mouth, do not yawn, sneeze or laugh (to prevent the spreading of pathogenic germs, especially the *Bacilli tuberculosis*)." *Charaka* I. 8. 17²⁶⁸.

Treatment against Poisoning : In the first poisoning, the patient should be made to vomit (the poison that has been ingested by an emetic) and then after giving cold water (to dissolve the poison that may be sticking to the wall of the alimentary canal), a detoxicant mixed with butter and honey should be given (to neutralize the toxins, and to make them comparatively innocuous by chemical combinations)" *Suśruta* V. 2. 25²⁶⁹

Treatment against venomous snake-bite :

267. दीर्घस्थं लाघवं ज्ञानिव्याधीनामस्थता रुचिः ।

वृषणशुद्धिः क्षुत्तृष्णा काली वेगप्रवर्त्तनम् ॥

बुद्धीन्द्रियमनःशुद्धिर्मातृस्यारुलोमता ।

सम्यग्भिरिक्तलिङ्गानि कायाग्नेश्वारुवर्त्तनम् ॥

चरक-संहिता, स त्रयानम., १५ ।

268. नासंस्तमुखे जृम्भां चवथुं ह्रास्यं वा प्रवर्त्तयेत् ।

चरक-संहिता, सुख्यानम., ८ ।

“If the arm or leg is bitten by a snake (if it be subcutaneous, the poisoning is slow, but if intravascular, it is rapid), a tight ligature should be made about four fingers' breadth above the wound, to prevent the poison flowing upward (with the blood or lymph) by cord, leather-band or tree bark (tourniquet, to compress the blood and the lymphatic vessels). Where tight ligature is not possible, free incisions should be made near the bite (to drain out the poisoned blood and the lymph) and the affected area cauterized (preferably by a liquid caustic, permanganate of potash—3 p. c. solution—which can penetrate deep into the tissues quickly). Suction (by hygroscopic calcined stones which suck the fluid with the poisonous principles), incision (to drain out the poisoned blood and the lymph) and cauterization (to destroy the poisonous principles and the poisoned area) are always applicable (after tight ligature). *Suśruta* V. 5. 2nd. Injection of polyvalent antivenom serum has proved very promising.

269. प्रथमे विषवेगे तु बालं शीतान्बुसेवितम् ।

अगदं मधुसर्पिर्भ्यां पावयेत् समायुतम् ॥

सुसुत-संहिता, कल्पस्थानम्, २ ।

270. सव्यैरेवाहितः सर्पैः शाखादृष्टस्य देहिणः ।

दंशस्त्रीपि बभ्रूयादरिष्टास्तुरङ्गुलं ॥

III. Sexual Hygiene.

Physical Maturity · “An intelligent physician should know that man at 25 years of age and woman at 16 attain at their (physical) maturity with full (organic) development.” *Susruta* I. 35. 9²⁷¹.

“He who cares for longevity should not have sexual intercourse, before he is 16 years old, or after he is 70 (Though a boy at 16 has his spermatozoa developed and is capable of reproduction, yet he needs to conserve and utilize the spermin up to the age of 25 for the development of his body and mind ; in old age, the tension of copulation is liable to cause rupture of the calcified and friable blood-vessels).” *Charaka* VI. 2. 60²⁷².

प्रीतचर्मात्तवक्त्राणां मृदुनान्यतमेन च ।

न गच्छति विषं देहमरिष्टाभिर्निवारितम् ॥

दृष्टेऽश्मयोक्तृत्य यत्र बन्धो न जायते ।

आचक्ष्ण्ये ददाह्वाः सर्वेतेषु तु पूजिताः ॥

सुश्रुत-संहिता, कल्पस्थानम्, ५

271. पञ्चविंशे ततो वयं पुमान् नारो तु षोडशे ।

समत्वागतशोथो तो जानायात् कुशलो भिषक् ॥ ८

सुश्रुत-संहिता, स्वस्थानम्, ३५ ।

272. नच वे षोडशावर्षात् सप्तत्याः परतो न च ।

आयुष्मानो नरः स्त्रीभिः संयोगं कर्तुमर्हति ॥

चरक-संहिता, चिकित्सितस्थानम्, २ ।

Tuberculosis increases sexual desire : "If a tuberculous patient (consumptive) gradually loses his strength, and his expectorations increase, yet he is fond of sexual intercourse, the disease will lead him to his death (It is well known that the tubercular patients become very sexually inclined ; it is very probable that the rich phosphorus contents of the *Bacillus tuberculosis* become liberated in the disintegration process as a reaction of the organism, and this circulating with the blood acts as an aphrodisiac, and consequently sexual erethism is one of the most distinguished characteristics of this disease)." *Charaka* VI. 3. 5²⁷³.

Sexual intercourse forbidden : "Do not have sexual intercourse with a menstruating woman (there seems to be a universal prejudice against intercourse with a menstruating woman ; it is possible that the presence of blood has been regarded by the primitive man as impure, or unesthetic ; it is probable, however, that the motive is more utilitarian, as many of the religious observances, regulations and injunctions are certainly based on principles of

273. बलञ्च क्षीयते यस्य प्रतिश्यायश्च वर्धते ।

तस्य नारीप्रसक्तस्य शोषोऽन्नायोपजायते ॥

चरक-संहिता, इन्द्रियस्थानम्, ५

hygiene or economic considerations ; in apparently cured and neglected old gonorrhea, the gonococci might still live in the upper tract, and may be dislodged with the flow of the menstrual blood, and cause urethritis to the man with whom she may have copulation, while in other times it might remain entirely innocuous ; a menstruating woman on her part is rather sexually inclined during that period, and would be much relieved of turgescence by the embrace), with a diseased, or unclean woman (for hygienic reasons) or with one whose vagina is narrow (vaginismus), whose beauty does not appeal (rouse the senses), or whose conduct is repulsive or who is artless, homely, or one who goes with other men (thus can be infected and spread the disease) ; nor go with another man's wife ; nor practise bestiality, or unnatural vices (sodomy and pederasty)." *Charaka* I. 8. 25³⁷⁴.

Aphrodisiac : "A pretty, youthful, well-formed, charmingly attired, willing and well-educated

274. न रजस्वलां नातुरां नामेध्यां नाशस्तां नानिष्टरूपाचारोपचारां नादृश
नाकामां नान्धकामां नान्धस्त्रियं नान्धयोनिं नायोनीं अभिगच्छेत् ।

चरक-संहिता, सूत्रस्थानम्, ८ ।

woman (wife) is the best aphrodisiac (in impotence)." *Charaka* VII. 2. 5²⁷⁵.

Impregnation : "In the (sexual) congress of man and woman, by the nervous tension heat (tumescence) is generated. The heat and (vaginal) secretion provoke the discharge of the semen, and which unites with the ovum (*ārtava* is a vague expression ; but it is certain that it meant more than menstruation blood, as it could not exist after menstrual flow ceased ; perhaps it was an indistinct conception of the ovule which when it becomes ripe, ruptures the Graafian follicle in which it is enclosed and causes menstruation). Then the united sperm and the ovum (the fecundated ovum) reach the uterus." *Suśruta* III. 3. 3²⁷⁶.

"As the germination (of a seed) takes place by the combination of proper season, field, moisture and seed, so pregnancy is developed

275. सुरुपा यौवनस्या या लक्षणैर्या विभूषिता ।

या वयसा शिञ्जिता या च सा स्त्री वृष्यतमा मता ॥

चरक-संहिता, चिकित्सितस्थानम्, २ ।

276. तव स्त्रीपुंसयोः संयोगे तेजः शरीरावायुद्वीरयति । ततस्तेजोऽग्नि-
सन्निपाताच्छुक्रं व्युत्तं योनिमभिप्रतिपद्यते संसृज्यते चार्तवेन । ततोऽग्निषोमसंयोगात्
संसृज्यमानो गर्भो गर्भाशयमनुप्रतिपद्यते ।

सुश्रुत-संहिता, शरीरस्थानम्, २ ।

by their proper combination (*rtu*=proper season standing for the first 12 days after menstruation ; *kṣetra*=field for uterus ; *amvu*=moisture for ovum ; *vīja*=seed, for sperm, i. e. for spermatozoon)." *Suśruta* III. 2. 33²⁷⁷.

Heredity : "The child inherits the characteristics of the parents acquired by them under the influence of diet, behaviour and (physical and mental) exertions, during their copulation (in which the impregnation takes place. Though hereditary transmission can not be explained by such a simple formula, yet it is undeniable that the germplasms must be under profound impression of the physical and the mental state of the parents in the time of fertilization. An irritable spermatozoon either by alcohol, or by the morbid condition of blood, is very apt to create the same diathesis in the offspring)." *Suśruta* III. 9. 63²⁷⁹.

"He who abstains from meat and wine, and

277. भुवं चतुर्थां सान्निध्यादगर्भः स्वादिधिपूर्वकः ।

चतुर्वेदानुबोजानां सामग्रादङ्गं यथा ॥

सुश्रुत-संहिता, शारीरस्थानम्, ३।

278. चाङ्गाराचारवेष्टामिर्याङ्गशोभिः समन्वितौ ।

स्त्रीपुंस्त्री सन्तुपेयातां तयोः पुत्रोऽपि तादृशः ॥ ४६

सुश्रुत-संहिता, शारीरस्थानम्, ४६ ।

takes only beneficial food, and leads a pure (hygienic) life, he and his descendants do not suffer from insanity." *Charaka* VI. 9. 63 ^{३१०}.

"If a man copulates with a menstruating woman on the first day of her course, he shortens his life, and there is embryonic abortion of the fruit of conception ; if on the second day, there is still-birth ; if on the third day, the child is of incomplete development and becomes short-lived ; but if on the fourth day, the child is well-developed and possesses good vitality (a long life). As a thing (floating substance) thrown in a river can not ascend up-stream against the course of the current, so when the menstrual blood flows, the seed (spermatozoon) can not enter in and become active (during the copulative act, the forward and the backward movement, especially of the glans-penis, acts almost like a valve of the suction-pump, creating a kind of vacuum state, widening the mouth of the womb, deflating it and drawing it forward, so that when the semen is discharged, it shoots like a jet of spray and is sucked by the womb with

279. निष्ठानामिषमद्यो यो हिताथी प्रयतः शुचिः ।

निजानामुमिषाद्देः सत्त्वान् न स युज्यते ॥

चरक-संहिता, चिकित्सितस्थानम्, ८ ।

the ovum ; in case the vagina is filled with menstrual blood or fluid, this suction can not but be incomplete ; the vaginal secretions at the entrance of the penis or in strong sexual desire serve simply to lubricate the passage, so that the delicate mucous membrane can not be hurt). Therefore one should not indulge in the sexual union during the first three days of menstruation, nor (after twelve days) in the month (in the second week the ovum begins to degenerate, and either it is incapable of fertilization, or if fecundated, it is apt to reproduce a weakling)." *Suśruta* III. 2. 31¹¹⁰.

Sex-determination of the offspring : "If a male child is desired, the husband should practise continence for a month (to increase sexual erethism and vigor), and after fattening himself with clarified butter, milk-fat, milk and rice, shall copulate with his wife after music, endearments (to excite the senses) and assurance of

280. तत् प्रथमे दिवसे ऋतुमत्यां नैद्युनगमनमनायुष्यं पुंसां भवति । यस्मिन् तदाद्योद्यते गर्भः, स प्रसवमानो विमुच्यते । द्वितीयेऽप्येव सति काण्डे वा । तृतीयेऽप्येवम्-सप्तपूर्णाङ्गोऽल्पायुर्वा भवति । चतुर्थे तु सप्तपूर्णाङ्गो दीर्घायुश्च भवति । न च प्रवर्तमाने रक्ते बीजं प्रविष्टं शुष्ककरं भवति, यथा नद्यां प्रतिबोतः प्रावि द्रव्यं प्रविष्टं प्रतिनिवर्तते नौर्यं गच्छति तद्वदेव द्रष्टव्यम् । तस्मान्निवर्तयन्तीं निराशं परिहरेत्, अतः परं मासादुपेयात् ॥ ११ सुयत-संहिता, भारीरस्त्रागम, २ ।

love to her, on the fourth, sixth, eighth, tenth or twelfth day of menstruation, and she likewise should have lived a continent life for a month, fattened herself with clarified butter and fed on oily and nitrogenous foods.

If the conjugal duty is performed on these days, it conduces to (the promotion of) wisdom, longevity, health, increase of population, wealth and strength.

If a girl is desired , sexual union should take place on the fifth, seventh, ninth or eleventh day. From the thirteenth day (up to the new monthly cycle ; from the second week after menstruation, the ovum begins to deteriorate and is usually incapable of impregnation) cohabitation is blameworthy (as the union is fruitless, it is only for the sensual gratification and indulgence, and not for the welfare of the race)". *Susruta* III. 2. 28-30²⁸¹.

281. ततोऽपराह्णे पुमान् मासं ब्रह्मचारी सर्पिस्त्रिंशः सर्पिःश्रीराभ्यां
शाख्योदनं भुक्त्वा मासं ब्रह्मचारिणो तैलस्त्रिंशं तैलमापोत्तराहारां नारीमुपेयाद्वावी
सामादिभिरभिविज्ञास्य विकल्पैर्बं चतुर्थ्यां षष्ठ्यामष्टम्यां दशम्यां द्वादश्याञ्चोपेयादिति
प्रवक्तव्यः ॥ २८

एषूत्तरोत्तरं विद्यादायुरारोग्यमेव च ।

प्रजासीमाग्यमैश्वर्यं बलञ्च दिवसेषु वै ॥ २९

अतः परं पञ्चम्यां सप्तम्यां नवम्यामिक्वादश्याञ्च स्त्रीकामः । तृयोदशीप्रभृतयो
निन्द्याः ॥ ३० मुमुत-संहिता, शरीररक्षणम्, २ ।

Sex-determination is still speculative. It was believed a few years ago that there were two kinds of ovum, male and female, the former produced by the right ovary and the latter by the left. By animal experimentation and human ovariectomy, it has been found to be erroneous. The egg produced by the ovary is still bi-sexual, hermaphroditic in nature, and its sex is not determined like all its mono-cellular prototypes, before it phylogenetically ascends the scale of evolution, that is before amphimixis is started through the process of fertilization by the male reproductive cell. That is the starting point of sexual differentiation which begins with the impregnation of the ovum. The question then arises whether the sex-determinant resides in the spermatozoon or in the ovum. In the Hymenoptera an accessory chromosome has been found in nearly half the spermatozoa, and it was regarded by McClung as the sex-determining factor. It may be simply an *'idant'*—bearer of arrested hereditary trait. But the experiments of Loeb have demonstrated that the spermatozoon, at least in the lower scale of evolution, only acts as a stimulant to start the amphimixis, and it can be substituted by artificial chemical stimulus. And in the aphids, parthenogenetic generations

